United States
Department of
Agriculture

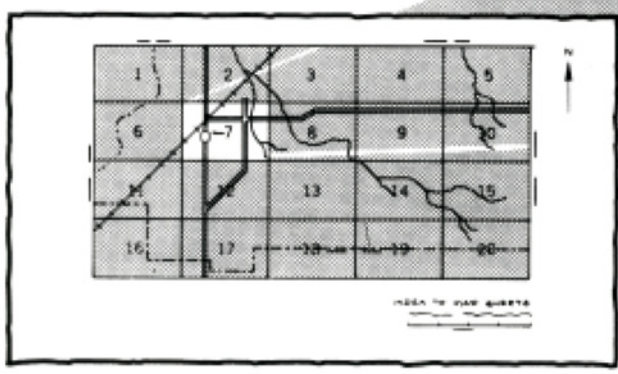
Soil
Conservation
Service

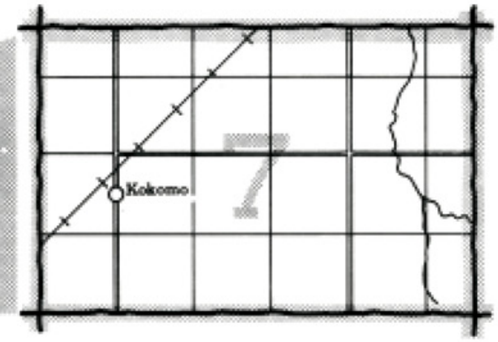
In cooperation with
West Virginia University
Agricultural and Forestry
Experiment Station

Soil Survey of Ritchie County West Virginia

HOW TO USE

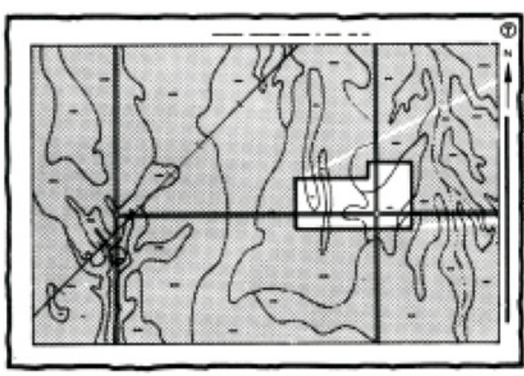
1. Locate your area of interest on the "Index to Map Sheets"

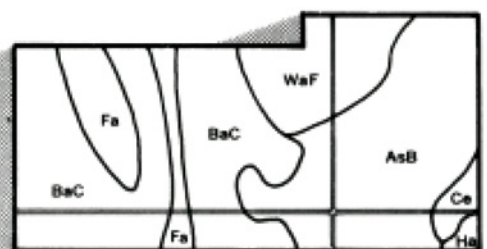




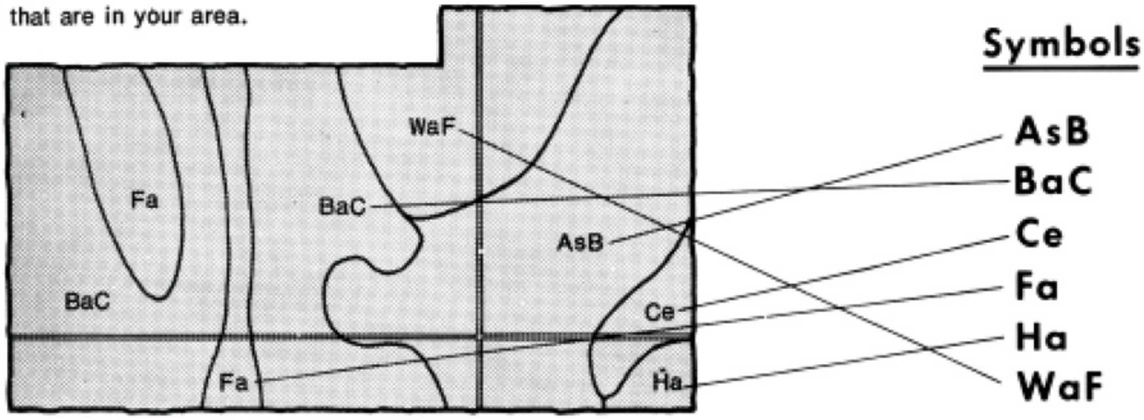
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



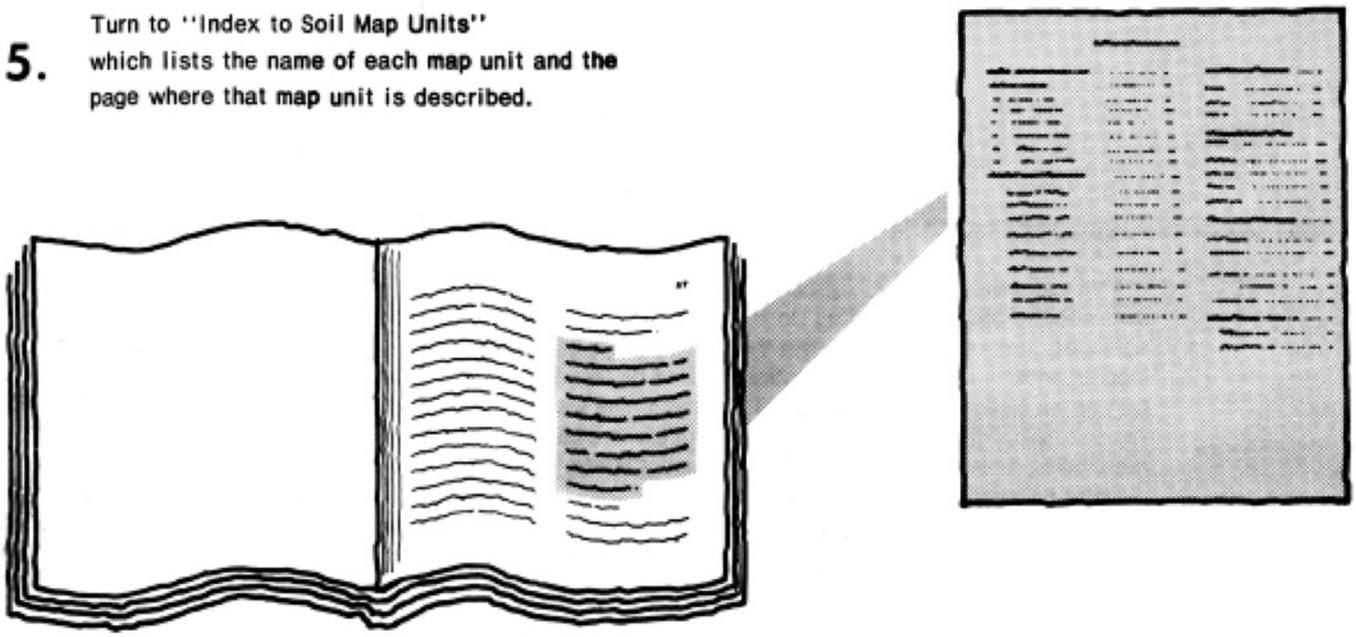


4. List the map unit symbols that are in your area.

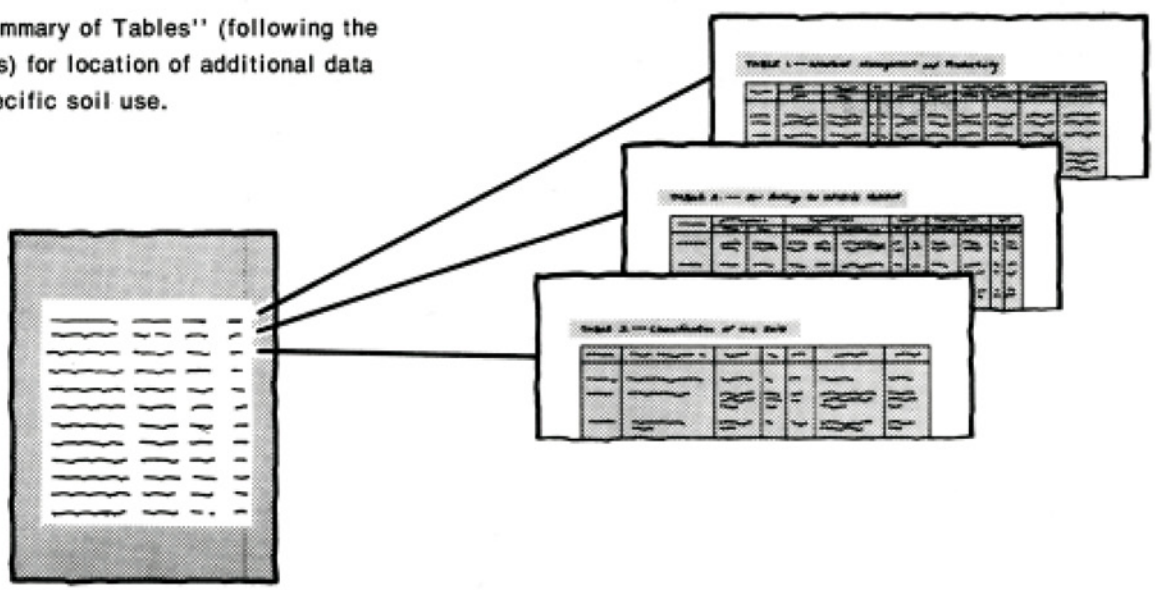


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United states Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1979. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. This survey was made cooperatively by the Soil Conservation Service and the West Virginia University Agricultural and Forestry Experiment Station. It is part of the technical assistance furnished to the Little Kanawha Soil Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: A typical landscape of Gilpin and Upshur soils on hillsides and ridgetops and Vandalia soils along drainageways.

Contents

Soil Series

Issued November 1986

Index to Map Units

Summary of Tables

Foreword

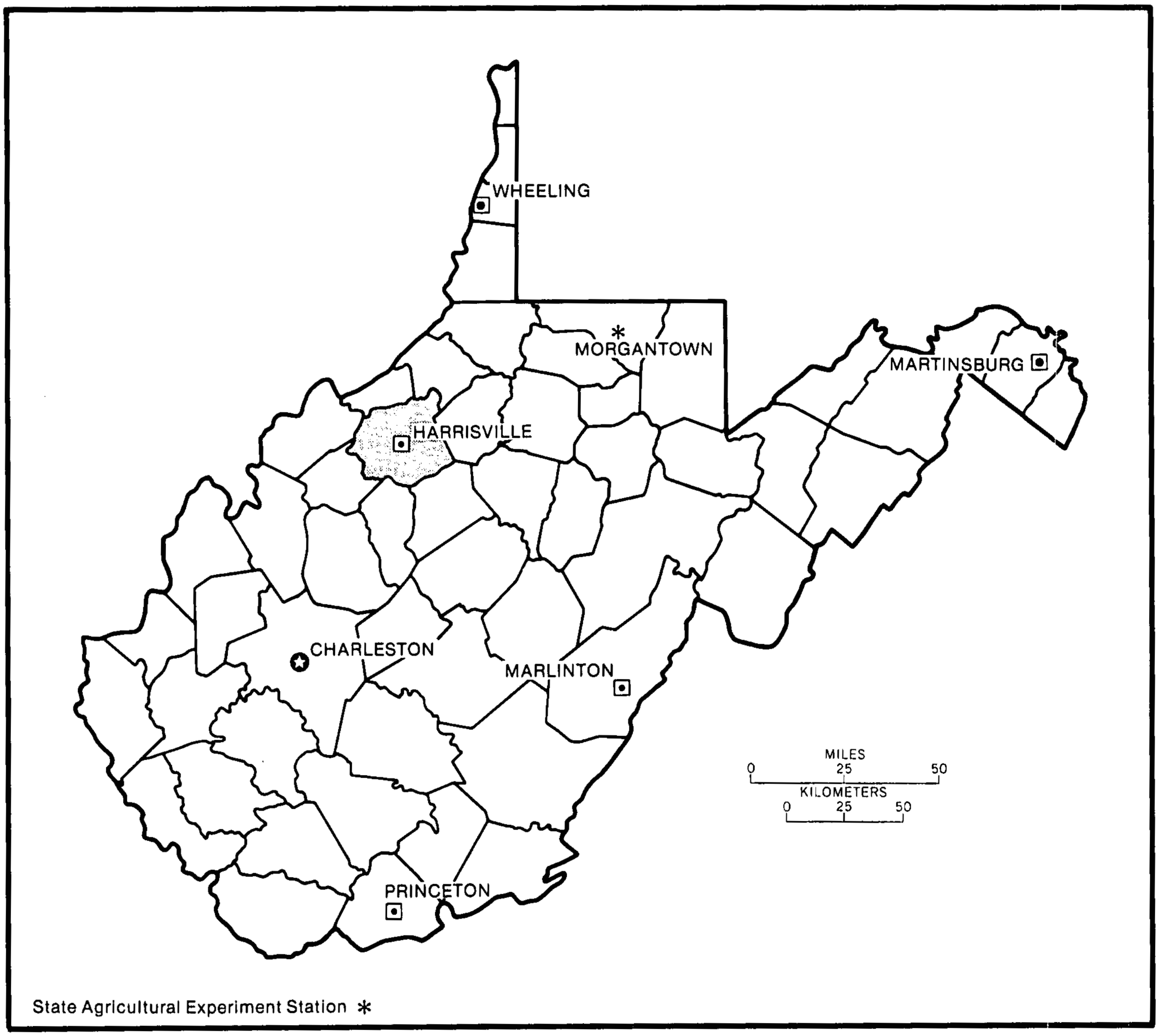
This soil survey contains information that can be used in land-planning programs in Ritchie County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife managment, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Rollin N. Swank
State Conservationist
Soil Conservation Service



Location of Ritchie County in West Virginia.

Soil Survey of Ritchie County, West Virginia

By Edward L. Wright, Frank A. Doonan, Walter J. Ellyson, and William E. Roth,
Soil Conservation Service

United States Department of Agriculture
Soil Conservation Service
In cooperation with
West Virginia University Agricultural and Forestry Experiment Station

Ritchie County is in the western part of West Virginia. The county has a total area of 289,280 acres, or 452 square miles. The population in 1970 was 10,145. Harrisville, the county seat and the largest city, had a population of 1,464.

The main enterprises in the county are timber production, farming, and oil and gas production. The oil and gas industry is the main source of employment.

The main public recreational facility in the county is North Bend State Park, a 1,405-acre area about 5 miles west of Harrisville. It offers boating, camping, fishing, picnicking, hiking, swimming, and lodging. About 3,300 acres of the Hughes River Public Hunting Area is in the southwestern part of the county.

The transportation needs of the county are served by a network of highways, including State Highways 16, 31, 47, 53, and 74 and U.S. Highway 50. The area is served by one railroad.

Elevation in the county ranges from 630 feet above sea level, at the point where the Hughes River leaves the county in the southwest, to 1,380 feet. The highest elevation is near Standley in the northeastern corner of the county.

General Nature of the Survey Area

This section describes farming trends in Ritchie County. The section also provides information about the county's physiography and geology in addition to information about the climate in the area.

Farming Trends

In 1924, according to the U.S. Department of Agriculture, 1,503 farms, totaling 163,667 acres, were in Ritchie County. Most farms were of the general type, and raising beef cattle was the common farming enterprise. On most farms, corn was grown on the narrow flood plains, on the ridgetops, and on the benches. The adjacent, steep hillsides were used for pasture and hay.

The 1969 Census of Agriculture indicates that about 31 percent of the county was being farmed. The 1970 USDA Soil and Water Conservation Needs Inventory lists 25,971 acres of cropland in Ritchie County.

Geology and Physiography

Gordon Bayles, geologist, Soil Conservation Service, assisted with the preparation of this section.

The exposed rock in Ritchie County is part of the Dunkard, Conemaugh, and Monongahela Groups and the Allegheny Formation. The exposed rock includes interbedded, acid, gray shale, siltstone, limy red shale, and gray sandstone. The dominant rock types of the Dunkard Group are limy red shale and siltstone. The dominant rock types of the Conemaugh and Monongahela Groups and the Allegheny Formation are acid, gray shale; siltstone; and acid, gray sandstone.

Rocks of the Monongahela and Conemaugh Groups and the Allegheny Formation are exposed mainly along the Burning Springs Anticline in the Oil Springs Petroleum area (*6*).

With the exception of some small areas along the Wirt and Wood County lines, the soils in Ritchie County formed in material weathered mainly from rock of the Dunkard Group. The soils along the Wirt and Wood County lines formed in material weathered mainly from rock of the Monongahela and Conemaugh Groups and the Allegheny Formation.

Ritchie County is on a highly dissected plateau in the Appalachian Plateaus Physiographic Province. Most of the area has narrow ridgetops and deep, V-shaped, narrow valleys with steep or very steep side slopes. The hillsides are marked with long, narrow benches.

Most of the flood plains along the smaller streams in the county are narrow. The largest flood plains and terraces in the county are along the Hughes River.

The north and south forks of the Hughes River and their tributaries drain all of Ritchie County.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Cairo, West Virginia, in the period 1951 to 1973. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 33 degrees F, and the average daily minimum temperature is 22 degrees. The lowest temperature on record, which occurred at Cairo on January 29, 1963, is -22 degrees. In summer the average temperature is 72 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred on September 3, 1953, is 102 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 41.96 inches. Of this, 24.07 inches, or 57 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 21 inches. The heaviest 1-day rainfall during the period of record was 3.9 inches at Cairo on September 13, 1971. Thunderstorms occur on about 45 days each year, and most occur in summer.

The average seasonal snowfall is 20 inches. The greatest snow depth at any one time during the period of record was 28 inches. On an average of 9 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 60 percent of the time possible in summer and 30 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 8 miles per hour, in March.

How This Survey was Made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General Soil Map Units" and "Detailed Soil Map Units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers and woodland managers, engineers, planners, developers and builders, home buyers, and others.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

1. Gilpin-Upshur-Vandalia

Gently sloping to very steep, well drained soils on uplands and foot slopes

This unit is throughout the survey area mainly on ridgetops, hillsides, and benches and in narrow valleys. A few rock outcrops are on some steep and very steep areas.

The unit makes up about 90 percent of the county and is about 37 percent Gilpin soils, 35 percent Upshur soils, 3 percent Vandalia soils, and 25 percent minor soils.

The Gilpin soils are moderately deep and gently sloping to very steep and are on uplands. The soils formed in acid material weathered from interbedded shale, siltstone, and sandstone. The Gilpin soils have a dark brown or dark grayish brown, medium-textured surface layer and a yellowish brown or strong brown, medium-textured or moderately fine textured subsoil that has channery or shaly fragments in the lower part.

The Upshur soils are deep and gently sloping to very steep and are on uplands. The soils formed in lime-influenced material weathered from shale. The Upshur soils have a dark brown, moderately fine textured surface layer and a dark reddish brown, fine-textured subsoil. They are susceptible to slipping.

The Vandalia soils are deep and strongly sloping or moderately steep and are on foot slopes. The soils formed in lime-influenced colluvial material which moved downslope mainly from areas of the Gilpin and Upshur soils. The Vandalia soils have a dark reddish brown, medium-textured or moderately fine textured surface layer and a yellowish red to reddish brown, moderately fine textured or fine-textured subsoil that has shaly fragments in the lower part. They are susceptible to slipping.

The dominant minor soils in the unit are well drained Hackers soils on high flood plains, well drained Moshannon and Sensabaugh soils on flood plains, moderately well drained Senecaville soils on flood plains, and moderately well drained Tilsit soils on upland ridgetops.

The ridgetops, foot slopes, and flood plains in this unit mostly have been cleared and are intensively used. The steep and very steep side slopes are mainly wooded. The erosion hazard is moderate or severe in most places. Slips are common on the side slopes and foot slopes.

Slope, moderately slow and slow permeability, depth to bedrock, shrink-swell potential, and the slip hazard are the main limitations of this unit for nonfarm use of the major soils. A seasonal high water table and a hazard of flooding are the main limitations of the minor soils.

2. Gilpin

Gently sloping to very steep, well drained soils on uplands

This unit is in the western part of the county along the Wood County line. It consists of gently sloping to strongly sloping, narrow ridgetops and steep to very steep side slopes. It has a few rock outcrops.

The unit makes up about 3 percent of the county and is about 60 percent Gilpin soils and 40 percent minor soils.

The Gilpin soils are moderately deep. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. The Gilpin soils have a dark brown or dark grayish brown, medium-textured surface layer and a yellowish brown or strong brown, medium-textured or moderately fine textured subsoil that has channery or shaly fragments in the lower part.

The dominant minor soils in the unit are well drained Moshannon and Sensabaugh soils on flood plains, moderately well drained Senecaville soils on flood plains, well drained Upshur soils and moderately well drained Tilsit soils on uplands, and well drained Vandalia soils on foot slopes.

Most of the bottom land in this unit has been cleared or is brushy and is reverting to woodland. The ridgetops and side slopes mainly are wooded. Erosion dominantly is moderate, but some areas are severely eroded.

Slope and depth to bedrock are the main limitations of the unit for nonfarm use of the major soils. A hazard of flooding and a hazard of slipping are the main limitations of the minor soils.

3. Moshannon-Monongahela-Hackers

Nearly level to strongly sloping, well drained and moderately well drained soils on flood plains and terraces

This unit consists of soils along the larger creeks and rivers of the county.

The unit makes up about 7 percent of the county and is about 28 percent Moshannon soils, 20 percent Monongahela soils, 7 percent Hackers soils, and 45 percent minor soils and water.

The Moshannon soils are deep, well drained, and nearly level. They are on flood plains. The soils formed in lime-influenced alluvial material washed from soils on uplands underlain by interbedded shale, siltstone, and sandstone. The Moshannon soils have a reddish brown, medium-textured surface layer and a reddish brown or dark reddish brown, medium-textured subsoil. The soils are occasionally flooded.

The Monongahela soils are deep, moderately well drained, and gently sloping or strongly sloping. They are on terraces. The soils formed in acid alluvial material washed from soils on uplands underlain by interbedded shale, siltstone, and sandstone. The Monongahela soils have a dark grayish brown, medium-textured surface layer and a yellowish brown or strong brown, medium-textured or moderately fine textured subsoil that is mottled in the lower part.

The Hackers soils are deep, well drained, and nearly level or gently sloping. They are on high flood plains. The soils formed in lime-influenced alluvial material washed from soils on uplands underlain by shale, siltstone, and sandstone. The Hackers soils have a dark brown, medium-textured surface layer and a reddish brown, medium-textured or moderately fine textured subsoil. The soils are subject to rare flooding.

The dominant minor soils in the unit are well drained Sensabaugh soils on alluvial fans and narrow flood plains, moderately well drained Senecaville soils on flood plains, poorly drained Melvin soils on flood plains, well drained Gallia soils on terraces, well drained Gilpin and Upshur soils on uplands, and well drained Vandalia soils on foot slopes.

Most of this unit has been cleared and is used for cultivated crops, hay, or homesites. The erosion hazard is slight or moderate.

Slope, permeability, a seasonal high water table, and flooding are the main limitations of the major soils for nonfarm use. Depth to bedrock, a seasonal high water table, flooding, and a hazard of slipping are the main limitations of the minor soils.

Detailed Soil Map Units

Dr. John Sencindiver, assistant professor of soil science, West Virginia University Agricultural and Forestry Experiment Station, assisted with the preparation of this section and the section "Soil Series and Their Morphology."

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, *Upshur silty clay, 20 to 30 percent slopes, severely eroded,* is one of several phases in the Upshur series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. *Upshur-Gilpin complex* is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. *Monongahela and Tilsit silt loams, 10 to 20 percent slopes* is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. *Quarries* is an example. Miscellaneous areas are shown on the soil maps and identified by a special symbol.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

GaB—Gallia silt loam, 3 to 10 percent slopes. This soil is gently sloping and well drained. It is on stream terraces along the major streams in the county.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is 60 inches thick. The upper 21 inches is dark yellowish brown and strong brown silt loam. The lower 39 inches is yellowish red loam. The substratum is yellowish red loam to a depth of 72 inches or more.

Included with this soil in mapping are a few small areas of moderately well drained Monongahela soils and well drained Gilpin and Upshur soils. Included soils make up about 20 percent of this unit.

The available water capacity of this Gallia soil is high. Permeability is moderate in the surface layer and subsoil and rapid in the substratum. Runoff is medium, and natural fertility is low or medium. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to farming. The hazard of erosion is moderate in unprotected areas and is a management concern. Conservation tillage, cultivating on the contour, using a rotation that includes hay, and mixing crop residues into the soil are practices that help to control erosion and maintain fertility and tilth. The use of proper stocking rates and the use of rotational grazing are major pasture management needs.

This soil has very high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour.

This soil has few limitations for community development.

The capability subclass is IIe.

GaC—Gallia silt loam, 10 to 20 percent slopes. This soil is strongly sloping and well drained. It is on stream terraces along the major streams in the county.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is 60 inches thick. The upper 21 inches is dark yellowish brown and strong brown silt loam. The lower 39 inches is yellowish red loam. The substratum is yellowish red loam to a depth of 72 inches or more.

Included with this soil in mapping are a few small areas of moderately well drained Monongahela soils and well drained Gilpin and Upshur soils. Included soils make up about 20 percent of this unit.

The available water capacity of this Gallia soil is high. Permeability is moderate in the surface layer and subsoil and rapid in the substratum. Runoff is rapid, and natural fertility is low or medium. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to farming. The hazard of erosion is severe in unprotected areas and is a management concern. Conservation tillage, growing crops in contour strips, using a rotation that includes hay, and mixing crop residue into the soil are practices that help to control erosion and maintain fertility and tilth. The use of proper stocking rates and the use of rotational grazing are the major pasture management needs.

This soil has very high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour.

Slope is the main limitation of this soil for community development.

The capability subclass is IIIe.

GlC—Gilpin silt loam, 10 to 20 percent slopes. This soil is strongly sloping and well drained. It is on ridgetops.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is 28 inches thick. The upper 5 inches is yellowish brown silty clay loam. The next 15 inches is strong brown channery silty clay loam. The lower 8 inches is strong brown channery loam. Bedrock is at a depth of 34 inches.

Included with this soil in mapping are small areas of well drained Upshur soils and moderately well drained Tilsit soils. Also included are small areas of soils similar to the Gilpin soil, but they are redder, are deeper than 40 inches to bedrock, or are underlain by soft, mottled shale at a depth of 30 to 40 inches. Some areas have spots of gently sloping soils, moderately steep soils, or severely eroded soils. Included soils make up about 20 percent of this unit.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is rapid, and natural fertility is low or medium. Where unlimed, this soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

This soil is suited to farming. The hazard of erosion is severe in unprotected areas and is a management concern. Conservation tillage, growing crops in contour strips, using a rotation that includes hay, maintaining sod in shallow drainageways, and mixing crop residue into the soil are practices that help to control erosion and maintain fertility and tilth. The use of proper stocking rates and the use of rotational grazing are the major pasture management needs.

This soil has high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour.

Slope and depth to bedrock are the main limitations of this soil for community development.

The capability subclass is IIIe.

GlD—Gilpin silt loam, 20 to 30 percent slopes. This soil is moderately steep and well drained. It is on ridgetops and benches. The benches commonly are dissected by drainageways.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsoil is 29 inches thick. The upper 6 inches is yellowish brown silty clay loam. The next 15 inches is strong brown channery silty clay loam. The lower 8 inches is strong brown channery loam. Bedrock is at a depth of 33 inches.

Included with this soil in mapping are small areas of well drained Upshur soils and moderately well drained Tilsit soils. Also included are small areas of soils similar to this Gilpin soil, but they are redder, are shallower than 20 inches or deeper than 40 inches to bedrock, are underlain by soft, mottled shale at a depth of 30 to 40 inches, or have more rock fragments or more sand. In some areas there are spots of strongly sloping soils, steep soils, severely eroded soils, very stony soils, or rock outcrop. Included areas make up about 20 percent of the unit.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is rapid, and natural fertility is low or medium. Where unlimed, this soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture than to cultivated crops. The hazard of erosion is severe in unprotected areas and is a major management concern. Conservation tillage, growing crops in contour strips, using a rotation that includes hay, maintaining sod in shallow drainageways, and mixing crop residue into the soil are practices in cultivated areas that help to control erosion and maintain fertility and tilth. The use of proper stocking rates and the use of rotational grazing are the major pasture management needs.

This soil has moderately high to high potential productivity for trees. About two-thirds of the acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour. Slope limits the use of woodland equipment.

Slope and the depth to bedrock are the main limitations of this soil for community development.

The capability subclass is IVe.

GID3—Gilpin silt loam, 20 to 30 percent slopes, severely eroded. This soil is moderately steep and well drained. It is on ridgetops and benches. The benches commonly are dissected by drainageways. Erosion has removed much of the original surface layer, and the subsoil is exposed in places.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil is 26 inches thick. The upper 3 inches is yellowish brown silty clay loam. The next 15 inches is strong brown channery silty clay loam. The lower 8 inches is strong brown channery loam. Bedrock is at a depth of 31 inches.

Included with this soil in mapping are small areas of well drained Upshur soils and moderatly well drained Tilsit soils. Also included are small areas of soils similar to this Gilpin soil, but they are redder, are shallower than 20 inches or deeper than 40 inches to bedrock, are underlain by soft, mottled shale at a depth of 30 to 40 inches, or have more rock fragments or more sand. Some areas have spots of strongly sloping soils, steep soils, very stony soils, or rock outcrop. Included areas make up about 20 percent of the unit.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is rapid, and natural fertility is low or medium. Where unlimed, this soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

A very severe erosion hazard makes this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The use of proper stocking rates, the use of rotational grazing, and seeding bare areas to permanent cover are the major pasture management needs.

This soil has moderately high to high potential productivity for trees. About two-thirds of the acreage is wooded. Erosion on logging roads and skid trails is a major hazard that can be controlled by placing the roads and trails on the contour. Slope limits the use of equipment.

Slope and the depth to bedrock are the main limitations of this soil for community development.

The capability subclass is VIe.

GIE—Gilpin silt loam, 30 to 40 percent slopes. This soil is steep and well drained. It is on narrow ridgetops and hillsides. The hillsides are commonly dissected by drainageways.

Typically, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is 27 inches thick. The upper 6 inches is yellowish brown silty clay loam. The next 12 inches is strong brown channery silty clay loam. The lower 9 inches is strong brown channery loam. Bedrock is at a depth of 30 inches.

Included with this soil in mapping are small areas of well drained Upshur and Vandalia soils. Also included are small areas of soils similar to this Gilpin soil, but they are redder, are shallower than 20 inches or deepr than 40 inches to bedrock, or have more rock fragments or more sand. Some areas have spots of moderately steep soils, very steep soils, severely eroded soils, very stony soils, or rock outcrop. Included areas make up about 25 percent of this unit.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is very rapid, and natural fertility is low or medium. Where unlimed, this soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

Slope and a very severe erosion hazard make this soil generally unsuitable for cultivated crops or hay. The soil is suited to pasture. The use of proper stocking rates, the use of rotational grazing, and seeding bare areas to permanent cover are the major pasture management needs.

This soil has moderately high to high potential productivity for trees. About three-fourths of the acreage is wooded. Erosion on logging roads and skid trails is a major hazard that can be controlled by placing the roads and trails on the contour. Slope limits the use of woodland equipment.

Slope and depth to bedrock are the main limitations of this soil for community development.

The capability subclass is VIe.

GIF—Gilpin silt loam, 40 to 55 percent slopes. This soil is very steep and well drained. It is on narrow ridgetops and hillsides. The hillsides commonly are dissected by drainageways.

Typically, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is 26 inches thick. The upper 6 inches is yellowish brown silty clay loam. The next 11 inches is strong brown channery silty clay loam. The lower 9 inches is strong brown channery loam. Bedrock is at a depth of 29 inches.

Included with this soil in mapping are small areas of well drained Upshur and Vandalia soils. Also included are small areas of soils similar to this Gilpin soil, but they are redder, have more sand or rock fragments, or are shallower than 20 inches to bedrock. Some areas have spots of moderately steep soils, severely eroded soils, very stony soils, or rock outcrop. Included soils make up about 30 percent of this unit.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is very rapid, and natural fertility is low or medium. Where unlimed, this soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

Slope makes this soil generally unsuited to cultivated crops or hay and difficult to manage for pasture. The soil has moderately high to high potential productivity for trees, and most of the acreage is wooded. Erosion on logging roads and skid trails is the major hazard. Placing the roads and trails on the contour will help to control this erosion. Slope limits the use of woodland equipment.

Slope and depth to bedrock are the main limitations of this soil for community development.

The capability subclass is VIIe.

GuE—Gilpin-Upshur complex, 30 to 40 percent slopes. The soils in this unit are steep and well drained. They are on hillsides, benches, and narrow ridgetops. The hillsides and benches commonly are dissected by drainageways, and landslips are in some areas. This unit is about 40 percent Gilpin silt loam, 35 percent Upshur silty clay loam, and 25 percent other soils. The soils are in such an intricate pattern that it was not practical to map them separately.

Typically, the surface layer of the Gilpin soil is dark grayish brown silt loam about 3 inches thick. The subsoil is 27 inches thick. The upper 6 inches is yellowish brown silty clay loam. The next 12 inches is strong brown channery silty clay loam. The lower 9 inches is strong brown channery loam. Bedrock is at a depth of 30 inches.

Typically, the surface layer of the Upshur soil is dark reddish brown silty clay loam about 3 inches thick. The subsoil is 33 inches thick. The upper 16 inches is reddish brown clay, and the lower 17 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 52 inches.

Included with these soils in mapping are small areas of well drained Vandalia and Sensabaugh soils. Also included are small areas of soils similar to the Gilpin soil, but that are less than 20 inches deep to bedrock and contain more sand or more rock fragments. Some areas consist of soils similar to the Upshur soil, but they are less than 40 inches deep to bedrock, contain more rock fragments, and are very strongly to extremely acid in the substratum. Also included are small areas of very steep soils, moderately steep soils, severely eroded soils, and extremely stony soils.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is very rapid, and natural fertility is low or medium. Where unlimed, the Gilpin soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The available water capacity of this Upshur soil is moderate to high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is very rapid, and natural fertility is medium or high. Where unlimed, the Upshur soil is very strongly acid to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil of the Upshur soil has a high shrink-swell potential.

Slope makes the soils in this unit generally unsuitable for cultivated crops or hay, but the soils are suited to pasture and some areas are used for pasture. The erosion hazard is very severe in unprotected areas, and overgrazing is a major management concern. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing until the Upshur soil is reasonably firm are major pasture management needs.

These soils have moderate to high potential productivity for trees. About three-fourths of the acreage is wooded. Erosion on logging roads and skid trails is a major hazard that can be controlled by placing the roads and trails on the contour. Slope limits the use of woodland equipment, and its use is further limited on the Upshur soil during wet seasons because the soil is soft and slippery.

Slope and depth to bedrock of the Gilpin soil and slope, a slip hazard, and the high shrink-swell potential, clayey texture, and low strength of the Upshur soil are the main limitations of this unit for community development.

The capability subclass is VIe.

GuE3—Gilpin-Upshur complex, 30 to 40 percent slopes, severely eroded. The soils in this unit are steep and well drained. Erosion has removed much of the original surface layer, and the subsoil is exposed in places. The unit is on hillsides, benches, and narrow ridgetops. The hillsides and benches commonly are dissected by drainageways, and landslips and gullies are common in some areas. This unit is about 40 percent Gilpin silt loam, 35 percent Upshur silty clay, and 25 percent other soils. The soils are in such an intricate pattern that it was not practical to map them separately.

Typically, the surface layer of the Gilpin soil is brown silt loam about 2 inches thick. The subsoil is 27 inches thick. The upper 6 inches is yellowish brown silty clay loam. The next 12 inches is strong brown channery silty clay loam. The lower 9 inches is strong brown channery loam. Bedrock is at a depth of 29 inches.

Typically, the surface layer of the Upshur soil is dark reddish brown silty clay about 2 inches thick. The subsoil is 33 inches thick. The upper 16 inches is reddish brown clay, and the lower 17 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 51 inches.

Included with these soils in mapping are small areas of well drained Vandalia and Sensabaugh soils. Also included are small areas of soils similar to the Gilpin soil, but they are less than 20 inches deep to bedrock and contain more sand or more rock fragments. Some areas consist of soils similar to the Upshur soil, but they are less than 40 inches deep to bedrock, contain more rock fragments, and are very strongly to extremely acid in the substratum. Also included are small areas of very steep soils, moderately steep soils, severely eroded soils, and extremely stony soils.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is very rapid, and natural fertility is low or medium. Where unlimed, the Gilpin soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The available water capacity of this Upshur soil is moderate to high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is very rapid, and natural fertility is medium or high. Where unlimed, the Upshur soil is very strongly acid to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil of the Upshur soil has a high shrink-swell potential.

Slope and a very severe erosion hazard make these soils generally unsuitable for cultivated crops or hay and difficult to manage for pasture. Seeding bare areas with a permanent plant cover helps to control the erosion. The soils have moderate to high potential productivity for trees. About half of the acreage is wooded. Erosion on logging roads and skid trails is the major hazard. Placing the roads and trails on the contour will help to control this erosion. Slope limits the use of woodland equipment, and its use is further limited on the Upshur soil during wet seasons because the soil is soft and slippery.

Slope and depth to bedrock of the Gilpin soil and slope, a slip hazard, the high shrink-swell potential, clayey texture, and low strength of the Upshur soil are the main limitations of this unit for community development.

The capability subclass is VIIe.

GuF—Gilpin-Upshur complex, 40 to 55 percent slopes. The soils in this unit are very steep and well drained. They are on hillsides and narrow ridgetops. The hillsides commonly are dissected by drainageways, and landslips are in some areas. This unit is about 40 percent Gilpin silt loam, 30 percent Upshur silty clay loam, and 30 percent other soils. The soils are in such an intricate pattern that it was not practical to map them separately.

Typically, the surface layer of the Gilpin soil is dark grayish brown silt loam about 3 inches thick. The subsoil is 26 inches thick. The upper 6 inches is yellowish brown silty clay loam. The next 11 inches is strong brown channery silty clay loam. The lower 9 inches is strong brown channery loam. Bedrock is at a depth of 29 inches.

Typically, the surface layer of the Upshur soil is dark reddish brown silty clay loam about 3 inches thick. The subsoil is 31 inches thick. The upper 15 inches is reddish brown clay, and the lower 16 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 52 inches.

Included with these soils in mapping are small areas of well drained Vandalia and Sensabaugh soils. Also included are small areas of soils similar to the Gilpin soil, but they are less than 20 inches deep to bedrock and contain more sand or more rock fragments. Some areas consist of soils similar to the Upshur soil, but they are less than 40 inches deep to bedrock, contain more rock fragments, and are very strongly to extremely acid in the substratum. Also included are small areas of very steep soils, moderately steep soils, severely eroded soils, and extremely stony soils.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is very rapid, and natural fertility is low or medium. Where unlimed, the Gilpin soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The available water capacity of this Upshur soil is moderate to high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is very rapid, and natural fertility is medium or high. Where unlimed, the Upshur soil is very strongly acid to slightly acid in the surface layer and subsoil, and strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil of the Upshur soil has a high shrink-swell potential.

Slope and a very severe erosion hazard make the soils in this unit generally unsuitable for cultivated crops or hay and difficult to manage for pasture. The soils have moderate to high potential productivity for trees. More than three-fourths of the acreage is wooded. Erosion on logging roads and skid trails is the major hazard. Placing the roads and trails on the contour will help to control this erosion. Slope limits the use of equipment, and its use is further limited on the Upshur soil during wet seasons because the soil is soft and slippery.

Slope and depth to bedrock of Gilpin soil and slope, a slip hazard, and the high shrink-swell potential, clayey texture, and low strength of the Upshur soil are the main limitations of this unit for community development.

The capability subclass is VIIe.

GuF3—Gilpin-Upshur complex, 40 to 55 percent slopes, severely eroded. The soils in this unit are very steep and well drained. They are on hillsides and narrow ridgetops. The hillsides commonly are dissected by drainageways, and landslips are in some areas. This unit is about 40 percent Gilpin silt loam, 30 percent Upshur silty clay loam, and 30 percent other soils. The soils are in such an intricate pattern that it was not practical to map them separately.

Typically, the surface layer of the Gilpin soil is brown silt loam about 2 inches thick. The subsoil is 26 inches thick. The upper 6 inches is yellowish brown silty clay loam. The next 11 inches is strong brown channery silty clay loam . The lower 9 inches is strong brown channery loam. Bedrock is at a depth of 28 inches.

Typically, the surface layer of the Upshur soil is dark reddish brown silty clay about 2 inches thick. The subsoil is 31 inches thick. The upper 15 inches is reddish brown clay, and the lower 16 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 51 inches.

Included with these soils in mapping are small areas of well drained Vandalia and Sensabaugh soils. Also included are small areas of soils similar to this Gilpin soil, but they are less than 20 inches deep to bedrock and contain more sand or more rock fragments. Some areas consist of soils similar to this Upshur soil, but they are less than 40 inches deep to bedrock, contain more rock fragments, and are very strongly to extremely acid in the substratum. Also included are small areas of very steep soils, moderately steep soils, and extremely stony soils.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is very rapid, and natural fertility is low or medium. Where unlimed, the Gilpin soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The available water capacity of this Upshur soil is moderate to high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is very rapid, and natural fertility is medium or high. Where unlimed, the Upshur soil is very strongly acid to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 50 inches. The subsoil of the Upshur soil has a high shrink-swell potential.

Slope and a very severe erosion hazard make the soils in this unit generally unsuitable for cultivated crops or hay and difficult to manage for pasture. The soils have moderate to high potential productivity for trees. More than three-fourths of the acreage is wooded. Erosion on logging roads and skid trails is the major hazard. Placing the roads and trails on the contour will help to control this erosion. Slope limits the use of equipment, and its use is further limited on the Upshur soil during wet seasons because the soil is soft and slippery.

Slope and depth to bedrock of Gilpin soil and slope, a slip hazard, and the high shrink-swell potential, clayey texture, and low strength of the Upshur soil are the main limitations of this unit for community development.

The capability subclass is VIIe.

GvF—Gilpin-Upshur complex, stony, 30 to 55 percent slopes. The soils in this complex are very steep and well drained. They are on hillsides and narrow ridgetops. The hillsides commonly are dissected by drainageways. Stones cover 1 to 3 percent of the surface of this unit. The unit is about 40 percent Gilpin soils, 30 percent Upshur soils and 30 percent other soils. The soils are in such an intricate pattern that it was not practical to map them separately.

Typically, the surface layer of the Gilpin soil is dark grayish brown silt loam about 3 inches thick. The subsoil is 26 inches thick. The upper 6 inches is yellowish brown silty clay loam. The next 11 inches is strong brown channery silty clay loam. The lower 9 inches is strong brown channery loam. Bedrock is at a depth of 29 inches.

Typically, the surface layer of the Upshur soil is dark reddish brown silty clay loam about 3 inches thick. The subsoil is 31 inches thick. The upper 15 inches is reddish brown clay, and the lower 16 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 52 inches.

Included with this soil in mapping are small areas of the well drained Vandalia soils and soils similar to this Gilpin soil, but they have less clay and more rock fragments in the subsoil. Also included are small areas of moderately steep soils, soils with no stones on the surface, and rock outcrop.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is very rapid, and natural fertility is low or medium. Where unlimed, the Gilpin soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The available water capacity of this Upshur soil is moderate to high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is very rapid, and natural fertility is medium or high. Where unlimed, the Upshur soil is very strongly acid to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil of the Upshur soil has a high shrink-swell potential.

Slope and the stones on the surface restrict the use of farm machinery and make these soils generally unsuitable for farming. The soils have moderate to high potential productivity for trees. More than three-fourths of the acreage is wooded. Erosion on logging roads and skid trails is the major hazard. Placing the roads and trails on the contour will help to control this erosion. Slope limits the use of woodland equipment, and its use is further limited on the Upshur soil during wet seasons because the soil is soft and slippery.

Slope and the depth to bedrock of the Gilpin soil and slope, a slip hazard, and the high shrink-swell potential, clayey texture, and low strength of the Upshur soil are the main limitations of this unit for community development.

The capability subclass is VIIs.

HaA—Hackers silt loam, 0 to 3 percent slopes. This soil is nearly level and well drained. It is on high flood plains along larger streams in the survey area.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is reddish brown and is 41 inches thick. The upper 7 inches is silt loam, the next 23 inches is silty clay loam, and the lower 11 inches is silt loam. The substratum is reddish brown silt loam to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of well drained Moshannon and Sensabaugh soils and moderately well drained Senecaville soils. Also included are small areas of soils similar to this Hackers soil, but they have more sand in the subsoil, have more brown in the subsoil, or are very strongly acid in the substratum. Some small areas consist of gently sloping soils. Included soils make up about 20 percent of this unit.

The available water capacity of this Hackers soil is high. Permeability is moderate. Runoff is slow, and natural fertility is high. Where unlimed, this soil is slightly acid to strongly acid. The depth to bedrock is more than 60 inches.

This soil is well suited to farming. Cultivated crops can be grown continuously on this soil, but the soil needs the protection of a cover crop. Working the residue from the cover crop into the soil helps to maintain fertility and tilth. The use of proper stocking rates and the use of rotational grazing are major pasture management needs.

This soil has very high potential productivity for trees, but only a small acreage is wooded.

A hazard of flooding is the main limitation of this soil for community development.

The capability class is I.

HaB—Hackers silt loam, 3 to 10 percent slopes. This soil is gently sloping and well drained. It is on high flood plains along larger streams in the survey area.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is reddish brown and is 41 inches thick. The upper 7 inches is silt loam, the next 23 inches is silty clay loam, and the lower 11 inches is silt loam. The substratum is reddish brown silt loam to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of well drained Moshannon and Sensabaugh soils and moderately well drained Senecaville soils. Also included are small areas of soils similar to this Hackers soil, but they have more sand in the subsoil, have more brown in the subsoil, or are very strongly acid in the substratum. Some small areas consist of nearly level or strongly sloping soils. Included soils make up about 20 percent of this unit.

The available water capacity of this Hackers soil is high. Permeability is moderate. Runoff is medium, and natural fertility is high. Where unlimed, this soil is slightly acid to strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to farming. The hazard of erosion is moderate in unprotected areas and is a management concern. Conservation tillage, cultivating on the contour, using a rotation that includes hay, and mixing crop residue into the soil are practices that help to control erosion and maintain fertility and tilth. The use of proper stocking rates and the use of rotational grazing are major pasture management needs.

This soil has very high potential productivity for trees, but only a small acreage is wooded.

A hazard of flooding is the main limitation of this soil for community development.

The capability subclass is IIe.

Me—Melvin silt loam. This soil is nearly level and poorly drained. It is on flood plains mostly along larger streams in the survey area. Slopes range from 0 to 5 percent but are typically 0 to 2 percent.

Typically, the surface layer is brown and light brownish gray silt loam about 6 inches thick and is mottled with strong brown. The subsoil is light gray silt loam 14 inches thick and is mottled with strong brown. The substratum extends to a depth of 60 inches or more. It is light brownish gray silty clay loam mottled with strong brown.

Included with this soil in mapping are small areas of well drained Hackers, Moshannon, and Sensabaugh soils and small areas of moderately well drained Senecaville soils. Also included are small areas of soils that have more sand or more clay than this Melvin soil and areas of gently sloping soils. Included soils make up about 25 percent of this unit.

The available water capacity of this Melvin soil is high. Permeability is moderate. Runoff is slow, and natural fertility is medium or high. Reaction ranges from medium acid to neutral. This Melvin soil has a seasonal high water table at or near the surface which restricts the root zone of many types of plants, and the soil is occasionally flooded. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops, but is better suited to water-tolerant hay and pasture plants than to cultivated crops. Flooding is a hazard for crops in some areas. Artificial drainage is needed for cultivated crops or for hay or pasture, and providing drainage is a major management concern. Most areas lack suitable drainage outlets, but in places diversions help to intercept runoff from higher areas. Conservation tillage, using a crop sequence that includes hay, delaying tillage until the soil is dry, and mixing crop residue into the soil are practices that help to maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing until the soil is firm are major pasture management needs.

This soil has very high potential productivity for trees that tolerate wetness, but only a small acreage is wooded. The use of equipment is restricted during wet seasons because the soil is soft.

The seasonal high water table, the hazard of flooding, and low strength are the main limitations of this soil for community development.

The capability subclass is IIIw.

MnB—Monongahela and Tilsit silt loams, 3 to 10 percent slopes. The soils in this unit are gently sloping and moderately well drained. The Monongahela soil is on terraces mostly along the major streams of the county, and the Tilsit soil is mostly on broad ridgetops. The total acreage of this unit is about 50 percent Monongahela soils, 30 percent Tilsit soils, and 20 percent other soils. Some areas consist entirely of Monongahela soils, some of Tilsit soils, and some of both. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Monongahela soil is dark grayish brown silt loam about 8 inches thick. The subsoil is 40 inches thick. The upper 16 inches is yellowish brown silty clay loam mottled in the lower part with strong brown and grayish brown. The lower 24 inches is a brittle layer of strong brown silty clay loam and gravelly silty clay loam mottled with grayish brown and dark yellowish brown. The substratum is strong brown gravelly loam mottled with red, light gray, yellowish red, and dark yellowish brown, and it extends to a depth of 60 inches or more.

Typically, the surface layer of the Tilsit soil is dark grayish brown and light olive brown silt loam about 10 inches thick. The subsoil is 31 inches thick. The upper 7 inches is light yellowish brown silt loam. The next 5 inches is light olive brown silt loam mottled in the lower part with grayish brown. The lower 19 inches is a brittle layer of olive brown and light yellowish brown silt loam mottled with strong brown, light brownish gray, and grayish brown. The substratum is light yellowish brown silt loam mottled with light brownish gray, and it extends to bedrock at a depth of about 46 inches.

Included with these soils in mapping are small areas of well drained Gallia, Gilpin, Upshur, and Vandalia soils. Also included are small areas of strongly sloping soils and severely eroded soils.

The available water capacity of these Monongahela and Tilsit soils is moderate. Permeability is moderately slow or slow. Runoff is medium, and natural fertility is low. Where unlimed, these soils are strongly acid or very strongly acid. A seasoned high water table at a depth of about 1-1/2 to 3 feet restricts the root zone of some types of plants. The depth to bedrock is more than 5 feet in the Monongahela soil and from 40 to 60 inches in the Tilsit soil.

These soils are suited to farming. The hazard of erosion is moderate in unprotected areas and is a management concern. Conservation tillage, cultivating on the contour, using a rotation that includes hay, and mixing crop residue into the soil are practices that help to control erosion and to maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing in the spring until the soils are firm are major pasture management needs.

These soils have moderately high potential productivity for trees. About one-fourth of the acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour. The use of equipment is restricted during wet seasons because the soils are soft.

The seasonal high water table and moderately slow or slow permeability are the main limitations of these soils for community development.

The capability subclass is IIe.

MnC—Monongahela and Tilsit silt loams, 10 to 20 percent slopes. The soils in this unit are strongly sloping and moderately well drained. The Monongahela soil is on terraces mostly along the major streams in the county, and the Tilsit soil is mostly on broad ridgetops. The total acreage of this unit is about 50 percent Monongahela soils, 30 percent Tilsit soils, and 20 percent other soils. Some areas consist entirely of Monongahela soils, some of Tilsit soils, and some of both. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Monongahela soil is dark grayish brown silt loam about 8 inches thick. The subsoil is 40 inches thick. The upper 16 inches is yellowish brown silty clay loam mottled in the lower part with strong brown and grayish brown. The lower 24 inches is a brittle layer of strong brown silty clay loam and gravelly silty clay loam mottled with grayish brown and dark yellowish brown. The substratum is strong brown gravelly loam mottled wih red, light gray, yellowish red, and dark yellowish brown, and it extends to a depth of 60 inches or more.

Typically, the surface layer of the Tilsit soil is dark grayish brown and light olive brown silt loam about 10 inches thick. The subsoil is 31 inches thick. The upper 7 inches is light yellowish brown silt loam. The next 5 inches is light olive brown silt loam mottled in the lower part with grayish brown. The lower 19 inches is a brittle layer of olive brown and light yellowish brown silt loam mottled with strong brown, light brownish gray, and grayish brown. The substratum is light yellowish brown silt loam mottled with light brownish gray, and it extends to bedrock at a depth of about 46 inches.

Included with these soil in mapping are small areas of well drained Gallia, Gilpin, Upshur, and Vandalia soils. Also included are small areas of gently sloping soils, moderately steep soils, and severely eroded soils.

The available water capacity of these Monongahela and Tilsit soils is moderate. Permeability is moderately slow or slow. Runoff is rapid, and natural fertility is low. Where unlimed, these soils are strongly acid or very strongly acid. A seasonal high water table at a depth of about 1 1/2 to 3 feet restricts the root zone of some types of plants. The depth to bedrock is more than 5 feet in the Monongahela soil and from 40 to 60 inches in the Tilsit soil.

These soils are suited to farming. The hazard of erosion is severe in unprotected areas and is a management concern. Conservation tillage, growing crops in contour strips, using a rotation that includes hay, and mixing crop residue into the soil are practices that help to control erosion and to maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing in the spring until the soils are reasonably firm are major pasture management needs.

These soils have moderately high potential productivity for trees. About one-fourth of the acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour. The use of equipment is restricted during wet seasons because the soils are soft.

Slope, the seasonal high water table, and the moderately slow or slow permeability are the main limitations of these soils for community development.

The capability subclass is IIIe.

MnC3—Monongahela and Tilsit silt loams, 10 to 20 percent slopes, severely eroded. The soils in this unit are strongly sloping and moderately well drained. Erosion has removed much of the original surface layer, and the subsoil is exposed in places. The Monongahela soil is on terraces mostly along the major streams in the county, and the Tilsit soil is mostly on ridgetops. The total acreage of this unit is about 50 percent Monongahela soils, 30 percent Tilsit soils, and 20 percent other soils. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Monongahela soil is brown silt loam 8 inches thick. The subsoil is 30 inches thick. The upper 11 inches is yellowish brown silty clay loam mottled in the lower part with strong brown and grayish brown. The lower 19 inches is a brittle layer of strong brown silty clay loam and gravelly silty clay loam mottled with grayish brown and dark grayish brown. The substratum is a brittle layer of strong brown gravelly loam mottled with red, light gray, yellowish red, and dark yellowish brown, and it extends to a depth of 60 inches or more.

Typically, the surface layer of the Tilsit soil is brown silt loam about 8 inches thick. The subsoil is 28 inches thick. The upper 4 inches is light yellowish brown silt loam. The next 5 inches is light olive brown silt loam mottled in the lower part with grayish brown. The lower 19 inches is a brittle layer of olive brown and light yellowish brown silt loam mottled with strong brown, light brownish gray, and grayish brown. The substratum is light yellowish brown silt loam mottled with light brownish gray, and it extends to bedrock at a depth of about 38 inches.

Included with these soils in mapping are small areas of well drained Gallia, Gilpin, Upshur, and Vandalia soils. Also included are small areas of gently sloping soils and moderately steep soils.

The available water capacity of these Monongahela and Tilsit soils is moderate. Permeability is moderately slow or slow. Runoff is rapid, and natural fertility is low. Where unlimed, these soils are strongly acid or very strongly acid. A seasonal high water table at a depth of about 1 1/2 to 3 feet restricts the root zone of some types of plants. The depth to bedrock is more than 5 feet in the Monongahela soil and from 40 to 60 inches in the Tilsit soil.

These soils have limited suitability for cultivated crops and are better suited to hay or pasture. The hazard of erosion is severe in unprotected areas and is a major management concern. Conservation tillage, growing crops in contour strips, using a rotation that includes hay, and mixing crop residue into the soil are practices in cultivated areas that help to control erosion and maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing in the spring until the soils are reasonably firm are major pasture management needs.

These soils have moderately high potential productivity for trees. About one-fourth of the acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour. The use of equipment is restricted during wet seasons because the soils are soft.

Slope, the seasonal high water table, and the moderately slow or slow permeability are the main limitations of these soils for community development.

The capability subclass is IVe.

Mo—Moshannon silt loam. This soil is nearly level and well drained. It is on flood plains along the large streams in the county. Slopes range from 0 to 3 percent.

Typically, the surface layer is reddish brown silt loam about 9 inches thick. The subsoil is reddish brown or dark reddish brown silt loam 32 inches thick. The substratum is reddish brown silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of well drained Hackers and Sensabaugh soils, moderately well drained Senecaville soils, and poorly drained Melvin soils. Also included along the smaller streams are many areas of soils similar to this Moshannon soil, but they have more sand in the subsoil and have a strongly acid or very strongly acid substratum of loamy sand or sand. Included soils make up about 20 percent of this unit.

The available water capacity of this Moshannon soil is high. Permeability is moderate. Runoff is slow, and natural fertility is high. Where unlimed, this soil is slightly acid or medium acid. The depth to bedrock is more than 60 inches.

This soil is suited to farming. In places, crops are subject to damage from flooding. Cultivated crops can be grown continuously on this soil, but it needs the protection of a cover crop. Working the residue from the cover crop into the soil is a practice that helps to maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing in the spring until the soil is firm are pasture management needs.

This soil has very high potential productivity for trees, but only a small acreage is wooded. The use of equipment is restricted during wet seasons because the soil is soft.

The hazard of flooding is the main limitation of this soil for community development.

The capability subclass is IIw.

Se—Senecaville silt loam. This soil is nearly level and moderately well drained. It is on flood plains along the larger streams in the county. Slopes range from 0 to 5 percent but are typically 0 to 3 percent.

Typically, the surface layer is reddish brown silt loam about 10 inches thick. The subsoil is 31 inches thick. It is yellowish red and reddish yellow silt loam mottled in the lower part with reddish gray and pinkish gray. The substratum is yellowish red and reddish yellow silt loam mottled with pinkish gray. It extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of well drained Hackers, Moshannon, and Sensabaugh soils and poorly drained Melvin soils. Also included are small areas of soils similar to this Senecaville soil, but they are more brown, have a subsoil of gravelly silt loam, or have a very strongly acid substratum. Also included are small areas of gently sloping soils. Included soils make up about 20 percent of this unit.

The available water capacity of this Senecaville soil is high. Permeability is moderate or moderately slow in the subsoil. Runoff is slow, and natural fertility is high. Where unlimed, this soil is slightly acid to strongly acid. A seasonal high water table at a depth of 1 1/2 to 3 feet restricts the root zone of some types of plants. The depth to bedrock is more than 60 inches.

This soil is suited to farming. In places, crops are subject to damage from flooding, and some small wet areas need artificial drainage to be suitable for crops. Cultivated crops can be grown continuously on this soil, but it needs the protection of a cover crop. Working the residue from the cover crop into the soil is a practice that helps to maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing in the spring until the soil is firm are major pasture management needs.

This soil has very high potential productivity for trees, but only a small acreage is wooded. The use of equipment is restricted during wet seasons because the soil is soft.

A hazard of flooding and the seasonal high water table are the main limitations of this soil for community development.

The capability subclass is IIw.

Sn—Sensabaugh silt loam. This soil is nearly level and gently sloping and is well drained. It is on flood plains along small streams and on alluvial fans at the mouths of hollows. Slopes range from 0 to 5 percent.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is reddish brown and is 19 inches thick. The upper 15 inches is silt loam, and the lower 4 inches is gravelly loam. The substratum is reddish brown very gravelly clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of well drained Moshannon and Vandalia soils, moderately well drained Senecaville soils, and poorly drained Melvin soils. Also included are small areas of soils with a subsoil of loamy sand and sand. Included soils make up about 20 percent of this unit.

The available water capacity of this Sensabaugh soil is moderate to high. Permeability is moderate or moderately rapid. Runoff is slow, and natural fertility is high. Reaction ranges from medium acid to neutral. The depth to bedrock is generally more than 60 inches.

This soil is suited to farming. In places, crops are subject to damage from flooding. Cultivated crops can be grown continuously on this soil, but the soil needs the protection of a cover crop. Working the residue from the cover crop into the soil is a practice that helps to maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing in the spring until the soil is firm are major pasture management needs.

This soil has high potential productivity for trees, but only a small acreage is wooded. The use of equipment is restricted during wet seasons because the soil is soft.

A hazard of flooding is the main limitation of this soil for community development.

The capability subclass is IIw.

Ua—Udorthents, smooth. This consists mainly of nearly level to very steep mixed soil material and rock fragments that have been disturbed by excavating, filling, grading, or other earth-moving operations. This unit is mainly along U.S. Route 50. In many areas the color and texture of the soil are similar to those of other soils in the vicinity of this unit. Most units have rock fragments in the surface layer and underlying layers.

Included with this unit in mapping are some of the soils that are near this unit. Also included are areas of rock outcrop, mostly near U.S. Route 50. Included areas make up about 15 percent of the unit.

Onsite investigation is necessary to determine suitability and limitations of the unit for a proposed use.

This unit is not assigned to a capability subclass.

UbB—Upshur silty clay loam, 3 to 10 percent slopes. This soil is gently sloping and well drained. It is mainly on ridgetops throughout the county.

Typically, the surface layer is reddish brown silty clay loam about 6 inches thick. The subsoil is 38 inches thick. The upper 23 inches is reddish brown clay. The lower 15 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 58 inches.

Included with this soil in mapping are small areas of Gilpin and Tilsit soils. Also included are a few areas of somewhat poorly drained soils, nearly level soils, strongly sloping soils, and severely eroded soils. Included soils make up about 20 percent of this unit.

The available water capacity of this Upshur soil is moderate to high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is medium, and natural fertility is medium or high. Where unlimed, this soil is very strongly acid to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil has a high shrink-swell potential.

This soil is suited to cultivated crops but is better suited to hay and pasture than to crops. The hazard of erosion is moderate in unprotected areas and is a management concern. In addition, this soil is difficult to till, and the soil becomes compact if it is tilled when wet. Conservation tillage, cultivating on the contour, using a rotation that includes hay, and mixing crop residue into the soil are practices that help to control erosion and maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing in the spring until the soil is firm are pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour. The use of equipment is restricted during wet seasons because this soil is soft and slippery.

The high shrink-swell potential, the clayey texture, and low strength are the main limitations of this soil for community development. The bedrock in the soil generally is soft and rippable.

The capability subclass is IIIe.

UbC—Upshur silty clay loam, 10 to 20 percent slopes. This soil is strongly sloping and well drained. It is mainly on ridgetops throughout the county.

Typically, the surface layer is reddish brown silty clay loam about 6 inches thick. The subsoil is 36 inches thick. The upper 21 inches is reddish brown clay. The lower 15 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 56 inches.

Included with this soil in mapping are small areas of Gilpin and Tilsit soils. Also included are a few areas of somewhat poorly drained soils, gently sloping soils, moderately steep soils, and severely eroded soils. Included soils make up about 20 percent of this unit.

The available water capacity of this Upshur soil is moderate to high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is rapid, and natural fertility is medium or high. Where unlimed, this soil is very strongly acid to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil has a high shrink-swell potential.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture than to crops. The hazard of erosion is severe in unprotected areas and is a management concern, and the soil becomes compact if it is tilled when wet. Conservation tillage, growing crops in contour strips, using a rotation that includes hay, maintaining sod in shallow drainageways, and mixing crop residue into the soil are practices in cultivated areas that help to control erosion and maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing in the spring until the soil is firm are major pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour. The use of equipment is restricted during wet seasons because this soil is soft and slippery.

The high shrink-swell potential, clayey texture, low strength, slope, and a slip hazard are the main limitations of this soil for community development. The bedrock in this soil generally is soft and rippable.

The capability subclass is IVe.

UbD—Upshur silty clay loam, 20 to 30 percent slopes. This soil is moderately steep and well drained. It is mainly on ridgetops throughout the county. Landslips are in some areas.

Typically, the surface layer is reddish brown silty clay loam about 6 inches thick. The subsoil is 35 inches thick. The upper 18 inches is reddish brown clay, and the lower 17 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 56 inches.

Included with this soil in mapping are small areas of Gilpin soils. Also included are small areas of moderately well drained soils, strongly sloping soils, steep soils, and severely eroded soils. Included soils make up about 20 percent of this unit.

The available water capacity of this Upshur soil is moderate to high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is rapid, and natural fertility is medium or high. Where unlimed, this soil is very strongly acid to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil has a high shrink-swell potential.

Slope and a severe erosion hazard make this soil generally unsuitable for cultivated crops and hay, but the soil is suited to pasture. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing until the soil is firm are major pasture management needs.

This soil has moderate or moderately high potential productivity for trees. About half of the acreage is wooded. Erosion on logging roads and skid trails is a major management concern. Placing the roads and trails on the contour will help to control this erosion. Slope limits the use of woodland equipment, and its use is further restricted during wet seasons because the soil is soft and slippery.

Slope, a hazard of slipping, the high shrink-swell potential, the clayey texture, and low strength are the main limitations of this soil for community development. The bedrock in this soil generally is soft and rippable.

The capability subclass is VIe.

UcC3—Upshur silty clay, 10 to 20 percent slopes, severely eroded. This soil is strongly sloping and well drained. It is mainly on ridgetops throughout the county. Erosion has removed much of the original surface layer, and the subsoil is exposed in places.

Typically, the surface layer is reddish brown silty clay about 5 inches thick. The subsoil is 34 inches thick. The upper 19 inches is reddish brown clay, and the lower 15 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 54 inches.

Included with this soil in mapping are small areas of Gilpin and Tilsit soils. Also included are a few areas of somewhat poorly drained soils, gently sloping soils, and moderately steep soils. Included soils make up about 20 percent of this unit.

The available water capacity of this Upshur soil is moderate to high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is rapid, and natural fertility is medium or high. Where unlimed, this soil is very strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil has a high shrink-swell potential.

Slope and a very severe erosion hazard make this soil generally unsuitable for cultivated crops and hay, but the soil is suited to pasture. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing in the spring until the soil is firm are major pasture management needs.

This soil has moderately high potential productivity for trees, but only about a fourth of the acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour. The use of woodland equipment is restricted during wet seasons because this soil is soft and slippery.

The high shrink-swell potential, the clayey texture, low strength, slope, and a slip hazard are the main limitations of this soil for community development. The bedrock in this soil generally is soft and rippable.

The capability subclass is VIe.

UcD3—Upshur silty clay, 20 to 30 percent slopes, severely eroded. This soil is moderately steep and well drained. It is mainly on ridgetops. Landslips are in some areas. Erosion has removed much of the original surface layer, and the subsoil is exposed in places.

Typically, the surface layer is reddish brown silty clay about 5 inches thick. The subsoil is 33 inches thick. The upper 16 inches is reddish brown clay, and the lower 17 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 53 inches.

Included with this soil in mapping are a few small areas of Gilpin soils. Also included are small areas of moderately well drained soils, strongly sloping soils, and steep soils. Included soils make up about 35 percent of this unit.

The available water capacity of this Upshur soil is moderate to high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is rapid, and natural fertility is medium or high. Where unlimed, this soil is very strongly acid to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil has a high shrink-swell potential.

Slope and erosion make this soil generally unsuitable for cultivated crops and hay and difficult to manage for pasture. The soil has moderate or moderately high potential productivity for trees, and about half of the acreage is wooded. Erosion on logging roads and skid trails is a major management concern. Placing the roads and trails on the contour will help to control this erosion. Slope limits the use of woodland equipment, and its use is further limited during wet seasons because the soil is soft and slippery.

Slope, a hazard of slipping, the high shrink-swell potential, the clayey texture, and low strength are the main limitations of this soil for community development. The bedrock in this soil generally is soft and rippable.

The capability subclass is VIIe.

UgB—Upshur-Gilpin complex, 3 to 10 percent slopes. The soils in this unit are gently sloping and well drained. They are mostly on broad ridgetops. The unit is about 45 percent Upshur silty clay loam, 35 percent Gilpin silt loam, and 20 percent other soils. The soils are in such an intricate pattern that it was not practical to map them separately.

Typically, the surface layer of the Upshur soil is reddish brown silty clay loam about 6 inches thick. The subsoil is 38 inches thick. The upper 23 inches is reddish brown clay, and the lower 15 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 58 inches.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 6 inches thick. The subsoil is 30 inches thick. The upper 4 inches is yellowish brown silty clay loam. The next 17 inches is strong brown channery silty clay loam. The lower 8 inches is strong brown channery loam. Bedrock is at a depth of 36 inches.

Included with these soils in mapping are small areas of moderately well drained Tilsit soils and soils similar to this Gilpin soil, but they are deeper than 40 inches to bedrock. Also included are small areas of nearly level soils, strongly sloping soils, and severely eroded soils.

The available water capacity of this Upshur soil is moderate or high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is medium, and natural fertility is medium or high. Where unlimed, the Upshur soil is very strongly acid to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil of the Upshur soil has a high shrink-swell potential.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is medium, and natural fertility is low or medium. Where unlimed, the Gilpin soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The soils in this unit are suited to farming. The hazard of erosion is moderate in unprotected areas and is a management concern. The Upshur soil is difficult to till and becomes compact if the soil is tilled when wet. Conservation tillage, cultivating on the contour, using a rotation that includes hay, and mixing crop residue into the soil are practices that help to control erosion and to maintain fertility and tilth. The use of proper stocking rates and deferment of grazing until the Upshur soil is firm are major pasture management needs.

These soils have moderately high to high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour. The use of equipment is restricted on the Upshur soil during wet seasons because the soil is soft and slippery.

The depth to bedrock of the Gilpin soil and the high shrink-swell potential, clayey texture, and low strength of the Upshur soil are the main limitations of these soils for community development. The bedrock in the Upshur soil generally is soft and rippable.

The capability subclass is IIe.

UgC—Upshur-Gilpin complex, 10 to 20 percent slopes. The soils in this unit are strongly sloping and well drained. They are on ridgetops and benches. The benches are dissected in places by drainageways, and landslips are in some areas. The unit is about 45 percent Upshur silty clay loam, 35 percent Gilpin silt loam, and 20 percent other soils. The soils are in such an intricate pattern that it was not practical to map them separately.

Typically, the surface layer of the Upshur soil is reddish brown silty clay loam about 6 inches thick. The subsoil is 36 inches thick. The upper 21 inches is reddish brown clay, and the lower 15 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 56 inches.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 6 inches thick. The subsoil is 28 inches thick. The upper 5 inches is yellowish brown silty clay loam. The next 15 inches is strong brown channery silty clay loam. The lower 8 inches is strong brown channery loam. Bedrock is at a depth of 34 inches.

Included with these soils in mapping are small areas of moderately well drained Tilsit soils and soils similar to this Gilpin soil, but they are deeper than 40 inches to bedrock or are shallower than 20 inches to bedrock. Also included are small areas of gently sloping soils, moderately steep soils, severely eroded soils, and somewhat poorly drained soils.

The available water capacity of this Upshur soil is moderate or high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is rapid, and natural fertility is medium or high. Where unlimed, the Upshur soil is very strongly to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil of the Upshur soil has a high shrink-swell potential.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is rapid, and natural fertility is low or medium. Where unlimed, the Gilpin soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The soils in this unit are suited to farming. The hazard of erosion is severe in unprotected areas and is a management concern. The Upshur soil is difficult to till and becomes compact if it is tilled when wet. Conservation tillage, growing crops in contour strips, using a rotation that includes hay, maintaining sod in shallow drainageways, and mixing crop residue into the soil are practices that help to control erosion and maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing until the Upshur soil is firm are major pasture managment needs.

These soils have moderately high or high potential productivity for trees, but only about a third of the acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour. The use of woodland equipment is restricted on the Upshur soil during wet seasons because the soil is soft and slippery.

Slope and depth to bedrock of the Gilpin soil and the slope, high shrink-swell potential, clayey texture, low stength, and slip hazard of the Upshur soil are the main limitations of these soils for community development. The bedrock in the Upshur soil generally is soft and rippable.

The capability subclass is IIIe.

UgC3—Upshur-Gilpin complex, 10 to 20 percent slopes, severely eroded. The soils in this unit are strongly sloping and well drained. They are on ridgetops and benches. Erosion has removed much of the original surface layer, and the subsoil is exposed in places. The benches are dissected in places by drainageways, and landslips are in some areas. The unit is about 45 percent Upshur silty clay, 35 percent Gilpin silt loam, and 20 percent other soils. The soils are in such an intricate pattern that it was not practical to map them separately.

Typically, the surface layer of the Upshur soil is reddish brown silty clay about 5 inches thick. The subsoil is 34 inches thick. The upper 19 inches is reddish brown clay, and the lower 15 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 54 inches.

Typically, the surface layer of the Gilpin soil is brown silt loam about 5 inches thick. The subsoil is 27 inches thick. The upper 4 inches is yellowish brown silty clay loam. The next 15 inches is strong brown channery silty clay loam. The lower 8 inches is strong brown channery loam. Bedrock is at a depth of 32 inches.

Included with these soils in mapping are small areas of moderately well drained Tilsit soils and soils similar to this Gilpin soil, but they are deeper than 40 inches to bedrock or are shallower than 20 inches to bedrock. Also included are small areas of gently sloping soils, moderately steep soils, and somewhat poorly drained soils.

The available water capacity of this Upshur soil is moderate or high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is rapid, and natural fertility is medium or high. Where unlimed, the Upshur soil is very strongly to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil of the Uphur soil has a high shrink-swell potential.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is rapid, and natural fertility is low or medium. Where unlimed, the Gilpin soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The soils in this unit have limited suitability for cultivated crops and are better suited to hay and pasture than to crops. The hazard of erosion is very severe in unprotected areas and is a major management concern. The Upshur soil is difficult to till and becomes compact if it is tilled when wet. Conservation tillage, growing crops in contour strips, using a rotation that includes hay, maintaining sod in shallow drainageways, and mixing crop residue into the soil are practices in cultivated areas that help to control erosion and maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing until the Upshur soil is firm are major pasture management needs.

These soils have moderately high or high potential productivity for trees, but only about a third of the acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour. The use of woodland equipment is restricted on the Upshur soil during wet seasons because the soil is soft and slippery.

Slope and depth to bedrock of the Gilpin soil and the slope, high shrink-swell potential, clayey texture, low strength, and slip hazard of the Upshur soil are the main limitations of these soils for community development. The bedrock in the Upshur soil generally is soft and rippable.

The capability subclass is IVe.

UgD—Upshur-Gilpin complex, 20 to 30 percent slopes. The soils in this unit are moderately steep and well drained. They are on ridgetops and benches. The benches commonly are dissected by drainageways, and landslips are in some areas. The unit is about 45 percent Upshur silty clay loam, 35 percent Gilpin silt loam, and 20 percent other soils. The soils are in such an intricate pattern that it was not practical to map them separately.

Typically, the surface layer of the Upshur soil is reddish brown silty clay loam about 6 inches thick. The subsoil is 35 inches thick. The upper 18 inches is reddish brown clay, and the lower 17 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 56 inches.

Typically, the surface layer of the Gilpin soil is dark brown silt loam about 6 inches thick. The subsoil is 28 inches thick. The upper 5 inches is yellowish brown silty clay loam. The next 15 inches is strong brown channery silty clay loam. The lower 8 inches is strong brown channery loam. Bedrock is at a depth of 34 inches.

Included with these soils in mapping are small areas of soils similar to this Gilpin soil, but they are deeper than 40 inches to bedrock or are shallower than 20 inches to bedrock. Also included are small areas of strongly sloping soils, steep soils, and severely eroded soils.

The available water capacity of this Upshur soil is moderate or high. The Upshur soil has moderate to high available water capacity. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is rapid, and natural fertility is medium or high. Where unlimed, the Upshur soil is very strongly acid to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil of the Upshur soil has a high shrink-swell potential.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is rapid, and natural fertility is low or medium. Where unlimed, the Gilpin soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

The soils in this unit have limited suitability for cultivated crops and are better suited to hay and pasture than to crops. The hazard of erosion is severe in unprotected areas and is a major management concern. The Upshur soil is difficult to till and becomes compact if it is tilled when wet. Conservation tillage, growing crops in contour strips, using a rotation that includes hay, maintaining sod in shallow drainageways, and mixing crop residue into the soil are practices in cultivated areas that help to control erosion and maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing until the Upshur soil is firm are major pasture management needs.

These soils have moderately high or high potential productivity for trees. About half of the acreage is wooded. Erosion on logging roads and skid trails is a major management concern. Placing the roads and trails on the contour will help to control this erosion. Slope limits the use of equipment, and its use is further limited on the Upshur soil during wet seasons because the soil is soft and slippery.

Slope and the depth to bedrock of the Gilpin soil and the slope, high shrink-swell potential, clayey texture, low strength, and slip hazard of the Upshur soil are the main limitations of these soils for community development. The bedrock in the Upshur soil generally is soft and rippable.

The capability subclass is IVe.

UgD3—Upshur-Gilpin complex, 20 to 30 percent slopes, severely eroded. The soils in this unit are moderately steep and well drained. They are on ridgetops and benches. Erosion has removed much of the original surface layer, and the subsoil is exposed in places. The bench areas commonly are dissected by drainageways, and landslips are common in some areas. The unit is about 45 percent Upshur silty clay, 35 percent Gilpin silt loam, and 20 percent other soils. The soils are in such an intricate pattern that it was not practical to map them separately.

Typically, the surface layer of the Upshur soil is reddish brown silty clay about 5 inches thick. The subsoil is 33 inches thick. The upper 16 inches is reddish brown clay, and the lower 17 inches is dark reddish brown shaly clay. The substratum is dark reddish brown very shaly silty clay that extends to bedrock at a depth of about 53 inches.

Typically, the surface layer of the Gilpin soil is brown silt loam about 5 inches thick. The subsoil is 26 inches thick. The upper 3 inches is yellowish brown silty clay loam. The next 15 inches is strong brown channery light silty clay loam. The lower 8 inches is strong brown channery loam. Bedrock is at a depth of 31 inches.

Included with these soils in mapping are small areas of soils similar to this Gilpin soil, but they are deeper than 40 inches to bedrock or are shallower than 20 inches to bedrock. Also included are small areas of strongly sloping soils and steep soils.

The available water capacity of this Upshur soil is moderate or high. Permeability is moderately slow in the surface layer and slow in the subsoil and substratum. Runoff is rapid, and natural fertility is medium or high. Where unlimed, the Upshur soil is very strongly acid to slightly acid in the surface layer and subsoil and is strongly acid to mildly alkaline in the substratum. The depth to bedrock ranges from 40 to 60 inches. The subsoil of the Upshur soil has a high shrink-swell potential.

The available water capacity of this Gilpin soil is low to moderate. Permeability is moderate. Runoff is rapid, and natural fertility is low or medium. Where unlimed, the Gilpin soil is strongly acid or very strongly acid. The root zone of some plants is restricted by bedrock at a depth of 20 to 40 inches.

Slope and a very severe erosion hazard make these soils generally unsuitable for cultivated crops or hay, but the soils are suited to pasture. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing until the Upshur soil is firm are major pasture management needs.

These soils have moderately high or high potential productivity for trees. About half of the acreage is wooded. Erosion on logging roads and skid trails is a major management concern. Placing the roads and trails on the contour will help to control this erosion. Slope limits the use of woodland equipment, and its use is further restricted on the Upshur soil during wet seasons because the soil is soft and slippery.

Slope and the depth to bedrock of the Gilpin soil and the slope, high shrink-swell potential, clayey texture, low strength, and slip hazard of the Upshur soil are the main limitations for community development. The bedrock in the Upshur soil generally is soft and rippable.

The capability subclass is VIe.

VaC—Vandalia silt loam, 10 to 20 percent slopes. This soil is strongly sloping and well drained. It is along the base of steep slopes, along drainageways, and on colluvial fans. Landslips are common in some areas, and seep spots are in places.

Typically, the surface layer consists of dark reddish brown silt loam about 6 inches thick. The subsoil is about 42 inches thick. The upper 35 inches is yellowish red, reddish brown, and dark reddish brown silty clay loam. The lower 7 inches is reddish brown channery silty clay. The substratum is dark reddish brown channery silty clay to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Sensabaugh soils. Also included are soils similar to this Vandalia soil, but they have less clay in the subsoil or are less than 60 inches deep to bedrock. There are also small areas of gently sloping soils, moderately steep soils, and severely eroded soils. Included soils make up about 20 percent of this unit.

The available water capacity of this Vandalia soil is moderate or high. Permeability is moderate or moderately slow in the surface layer and moderately slow or slow in the subsoil. Runoff is rapid, and natural fertility is medium or high. Where unlimed, this soil is medium acid to very strongly acid in the surface layer and upper part of the subsoil and is strongly acid to neutral in the lower part of the subsoil and in the substratum. The depth to bedrock is more than 60 inches. The subsoil has a high shrink-swell potential.

This soil is suited to cultivated crops and to hay and pasture. The hazard of erosion is severe in unprotected areas and is a major management concern. Conservation tillage, growing crops in contour strips, using a rotation that includes hay, maintaining sod in shallow drainageways, and mixing crop residue into the soil are practices that help to control erosion and maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing until the soil is firm are major pasture management needs.

This soil has moderately high potential productivity for trees. About a fourth of the acreage is wooded. Erosion on logging roads and skid trails is a hazard that can be controlled by placing the roads and trails on the contour. The use of equipment is restricted during wet seasons because the soil is soft and slippery.

The high shrink-swell potential, the moderately slow or slow permeability, the clayey texture, low strength, and a slip hazard are the main limitations of this soil for community development.

The capability subclass is IIIe.

VaD—Vandalia silt loam, 20 to 30 percent slopes. This soil is moderately steep and well drained. It is at the base of steep slopes and at the head of drainageways. It commonly is dissected by drainageways. Landslips are common in many areas, and seep spots are in some areas.

Typically, the surface layer is dark reddish brown silt loam about 6 inches thick. The subsoil is about 44 inches thick. The upper 36 inches is yellowish red, reddish brown, and dark reddish brown silty clay loam. The lower 8 inches is reddish brown channery silty clay. The substratum is dark reddish brown channery silty clay to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Sensabaugh, Gilpin, and Upshur soils. Also included are soils similar to this Vandalia soil, but they have less clay in the subsoil or they are less than 60 inches deep to bedrock. There are small areas of strongly sloping soils, steep soils, stony soils, and severely eroded soils. Included soils make up about 25 percent of this unit.

The available water capacity of this Vandalia soil is moderate or high. Permeability is moderate or moderately slow in the surface layer and moderately slow or slow in the subsoil. Runoff is rapid, and natural fertility is medium or high. Where unlimed, this soil is medium acid to very strongly acid in the surface layer and upper part of the subsoil and is strongly acid to neutral in the lower part of the subsoil and in the substratum. The depth to bedrock is more than 60 inches. The subsoil has a high shrink-swell potential.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture than to crops. The hazard of erosion is severe in unprotected areas and is a major management concern. Conservation tillage, growing crops in contour strips, using a rotation that includes hay, maintaining sod in shallow drainageways, and mixing crop residue into the soil are practices in cultivated areas that help to control erosion and maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing until the soil is firm are major pasture management needs.

This soil has moderately high or high potential productivity for trees. About half of the acreage is wooded. Erosion on logging roads and skid trails is the major management concern. Placing the roads and trails on the contour will help to control this erosion. Slope limits the use of woodland equipment, and its use is further limited during wet seasons because the soil is soft and slippery.

Slope, the high shrink-swell potential, a slip hazard, and the clayey texture, low strength, and moderately slow or slow permeability are the main limitations of this soil for community development.

The capability subclass is IVe.

VdC3—Vandalia silty clay loam, 10 to 20 percent slopes, severely eroded. This soil is strongly sloping and well drained. It is at the base of steep slopes, along drainageways, and on colluvial fans. Erosion has removed much of the original surface layer, and the subsoil is exposed in places. Landslips are in some areas, and seep spots are in places.

Typically, the surface layer is reddish brown silty clay loam about 6 inches thick. The subsoil is about 40 inches thick. The upper 33 inches is yellowish red, reddish brown, and dark reddish brown silty clay loam. The lower 7 inches is reddish brown channery silty clay. The substratum is dark reddish brown channery silty clay to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Sensabaugh soils. Also included are soils similar to this Vandalia soil, but they have less clay in the subsoil or are less than 60 inches deep to bedrock. There are small areas of gently sloping soils, moderately steep soils, and very severely eroded soils. Included soils make up about 20 percent of this unit.

The available water capacity of this Vandalia soil is moderate or high. Permeability is moderate or moderately slow in the surface layer and moderately slow or slow in the subsoil. Runoff is rapid, and natural fertility is medium or high. Where unlimed, this soil is medium acid to very strongly acid in the surface layer and upper part of the subsoil and is strongly acid to neutral in the lower part of the subsoil and in the substratum. The depth to bedrock is more than 60 inches. The subsoil has a high shrink-swell potential.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture than to crops. The hazard of erosion is very severe in unprotected areas and is a major management concern. Conservation tillage, growing crops in contour strips, using a rotation that includes hay, maintaining sod in shallow drainageways, and mixing crop residue into the soil are practices in cultivated areas that help to control erosion and maintain fertility and tilth. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing until the soil is firm are major pasture management needs.

This soil has moderately high potential productivity for trees. About a fourth of the acreage is wooded. Erosion on logging roads and skid trails is a major management concern. Placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because the soil is soft and slippery.

The high shrink-swell potential, the moderately slow or slow permeability, the clayey texture, low strength, and a slip hazard are the main limitations of this soil for community development.

The capability subclass is IVe.

VdD3—Vandalia silty clay loam, 20 to 30 percent slopes, severely eroded. This soil is moderately steep and well drained. It is at the base of steep slopes and at the head of drainageways. Erosion has removed much of the original surface layer, and the subsoil is exposed in many places. This soil is dissected by drainageways. Landslips, bare spots, and gullies are common in many areas. Seep spots are in places.

Typically, the surface layer is reddish brown silty clay loam about 6 inches thick. The subsoil is about 42 inches thick. The upper 34 inches is yellowish red, reddish brown, and dark reddish brown silty clay loam. The lower 8 inches is reddish brown channery silty clay. The substratum is dark reddish brown channery silty clay to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Sensabaugh, Gilpin, and Upshur soils. Also included are soils similar to this Vandalia soil, but they have less clay in the subsoil or are less than 60 inches deep to bedrock. There are small areas of strongly sloping soils, steep soils, and stony soils. Included soils make up 25 percent of this unit.

The available water capacity of this Vandalia soil is moderate or high. Permeability is moderate or moderately slow in the surface layer and moderately slow or slow in the subsoil. Runoff is rapid, and natural fertility is medium or high. Where unlimed, this soil is medium acid to very strongly acid in the surface layer and upper part of the subsoil and is strongly acid to neutral in the lower part of the subsoil and in the substratum. The depth to bedrock is more than 60 inches. The subsoil has a high shrink-swell potential.

Slope and a very severe erosion hazard make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The use of proper stocking rates, the use of rotational grazing, and deferment of grazing until the soil is firm are major pasture management needs.

This soil has moderately high or high potential productivity for trees. About half of the acreage is wooded. Erosion on logging roads and skid trails is the major management concern. Placing the roads and trails on the contour will help to control this erosion. Slope limits the use of equipment, and its use is further limited during wet seasons because the soil is soft and slippery.

Slope, a slip hazard, the high shrink-swell potential and clayey texture, low strength, and the moderately slow or slow permeability are main limitations of this soil for community development.

The capability subclass is VIe.

Prime Farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is treated and managed using acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland may now be in crops, pasture, woodland, or other land, but not urban and built-up land or water areas. It must either be used for producing food or fiber or be available for these uses.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It also has favorable temperature and growing season and an acceptable level of acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not flooded during the growing season. The slope range is mainly from 0 to 6 percent. For more detailed information on the criteria for prime farmland, consult the local staff of the Soil Conservation Service.

About 17,770 acres, or about 6 percent of Ritchie County, meets the soil requirements for prime farmland. The areas are adjacent to the streams throughout the county. A recent trend in land use in some parts of the county has been toward the loss of some prime farmlands to nonagricultural uses. This loss puts pressure on marginal lands, which generally are more erodible, and more difficult to cultivate, and usually are less productive.

Soil map units that make up prime farmland in Ritchie County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units."

Soils that have limitations or special qualifications may qualify for prime farmland if those limitations are overcome or the qualifications are met. In the following list, the corrective measures or qualifications are shown in parentheses. Onsite evaluation is necessary to see if the limitations have been overcome by corrective measures.

The map units that meet the soil requirements for prime farmland are:

HaA Hackers silt loam, 0 to 3 percent slopes
HaB Hackers silt loam, 3 to 10 percent slopes (where slope is 6 percent or less)
Me Melvin silt loam (where drained)
Mo Moshannon silt loam
Se Senecaville silt loam
Sn Sensabaugh silt loam

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Dixie Shreve, resource conservationist, Soil Conservation Service, assisted with the preparation of this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Some general principles of management apply throughout the survey area to all soils suitable for farm crops and pasture, although individual soils or groups of soils commonly require different kinds of management. The general principles of management are described in the following paragraphs.

Most of the soils in Ritchie County have a moderate or low supply of basic plant nutrients, making the application of lime and fertilizer necessary. The amounts to be applied depend on the type of soil, cropping history, the type of crop grown, the level of desired yield, and the results of laboratory analysis of soil samples.

The organic matter content is low in most soils in the survey area, and it is not feasible to build it to a higher level. It is important, however, to maintain the current level by adding farm manure, by returning crop residue to the soil, and by growing sod crops, cover crops, and green-manure crops.

Tillage tends to break down soil structure and should be kept to the minimum necessary to prepare the seedbed and control weeds. Maintaining the organic matter content of the surface layer also helps to protect the structure.

Artificial drainage is needed in some soils to make them suitable for cultivated crops or for hay and pasture. Soils with a dense, brittle layer or clayey texture in the subsoil are difficult to drain with tile. Such soils generally respond better to open-ditch drainage where suitable outlets are available.

Runoff and erosion occur mainly while a cultivated crop is growing or soon after it has been harvested. All of the gently sloping and steeper soils in the county that are cultivated are subject to erosion and thus require a suitable cropping system for erosion control. The main management needs of such a system include the proper rotation of crops, conservation tillage, mulch planting, using crop residue, growing cover crops and green-manure crops, and using lime and fertilizer. Other major erosion-control practices are contour cultivation, contour stripcropping, and using grassed waterways. The effectiveness of a particular combination of these practices differs from one soil to another, but different combinations can be equally effective on the same soil.

Using the soils for pasture is effective in controlling erosion in most areas. A high level of pasture management, including fertilization, control of grazing, and careful selection of pasture mixtures, is needed on some soils to provide enough plant cover to prevent erosion. Grazing is controlled by rotating the livestock from one pasture to another and by providing idle periods for the pasture to allow for regrowth of the plants. Some soils need pasture mixtures that require the least renovation to maintain good plant cover and forage for grazing.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Woodland Management and Productivity

Lewis Rowan, woodland conservationist, Soil Conservation Service, assisted with the preparation of this section.

Woodland in Ritchie County occupies about 215,400 acres (*3*), or 74 percent of the total land. Most of the wooded areas are privately owned, and many of the tracts are large. Most of the land west of Harrisville between U.S. Route 50 and State Route 47 is wooded, with small farms scattered throughout the area.

Most of the woodland in Ritchie County is on Gilpin and Upshur soils. Many areas of Monongahela, Tilsit, and Vandalia soils are in stands of Virginia pine. Very little woodland is on the bottom lands because those areas are used mainly for intensive farming.

The four major forest types in Ritchie County are oak-hickory, Virginia pine-shortleaf pine-pitch pine, maple-beech-birch, and other hardwood types. The oak-hickory type covers about 65 percent of the total woodland in the county, the Virginia pine and pitch pine type about 5 percent, the maple-beech-birch type about 14 percent, and other hardwood types about 16 percent.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. The trees are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Gary A. Gwinn, biologist, Soil Conservation Service, assisted with the preparation of this section.

Plant composition and land use patterns in Ritchie County favor those wildlife species associated with woodland and "edge" habitats. White-tailed deer, ruffed grouse, squirrels, and cottontail rabbits inhabit areas throughout the county. The deer population is rapidly expanding as evidenced by increasing kills during the past several hunting seasons. Wild turkey populations are becoming established in various parts of the county, particularly in and around the Hughes River Public Hunting area. The population of grouse and squirrel is generally high throughout most of the region.

The diverse plant types in the county support a wide variety of song birds, raptors, and small mammals. The common furbearers in the county are skunks, opossum, muskrat, mink, and foxes.

Ritchie County's rivers, streams, and impoundments support various species of warmwater fish. Smallmouth bass and muskellunge are the major game species in the local streams. Other common species are largemouth bass, channel catfish, bluegill, and sunfish.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, orchardgrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, ragweed, and wild carrot.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are amur honeysuckle, silky cornel, and autumn-olive.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are Virginia pine and cedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, bulrushes, cattails, burreeds, sweet flag, rushes, and sedges.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, meadow vole, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

James L. Dove, conservation engineer, Soil Conservation Service, assisted with the preparation of this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 16 gives the frequency of flooding. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*5*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning humid, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludults (*Hapl*, meaning minimal horizonation, plus *udults*, the suborder of the Ultisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludults.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*4*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*5*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Gallia series

The Gallia series consists of deep, well drained soils formed in alluvial material washed from acid and lime-influenced soils on uplands. Gallia soils are on terraces along the major streams in the county. Slopes range from 3 to 20 percent.

Gallia soils are on the landscape with well drained Vandalia soils and moderately well drained Monongahela soils. The Gallia soils have less clay and more sand than the Vandalia soils and do not have the fragipan typical of the Monongahela soils.

Typical pedon of Gallia silt loam, 10 to 20 percent slopes, in a hayfield near the confluence of Bone Creek and the South Fork of the Hughes River, about 1 1/2 miles southwest of Berea:

Ap—0 to 7 inches, dark brown (10YR 4/3) silt loam; moderate medium granular structure; very friable; many roots; medium acid; abrupt smooth boundary.
B1—7 to 15 inches, dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common roots; strongly acid; clear smooth boundary.
B21t—15 to 28 inches, strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; friable; few roots; few discontinuous clay films on faces of peds; very strongly acid; gradual smooth boundary.
B22t—28 to 42 inches, yellowish red (5YR 4/6) loam; moderate medium subangular blocky structure; firm; few roots; common discontinuous clay films on faces of peds; very strongly acid; clear smooth boundary.
B3t—42 to 67 inches, yellowish red (5YR 4/6) loam; weak medium subangular blocky structure; firm; few discontinuous clay films on faces of peds; few black coatings; very strongly acid; gradual smooth boundary.
C—67 to 72 inches, yellowish red (5YR 5/6) loam; massive; friable; very strongly acid.

The solum thickness ranges from 60 to 100 inches. The depth to bedrock is more than 60 inches. Coarse fragments of gravel make up 0 to 20 percent of the lower part of the solum and of the C horizon. In unlimed areas the soils are strongly acid or very strongly acid.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4.

The B1 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 through 6.

The B2 and B3 horizons have hue of 5YR or 2.5YR, value of 3 through 5, and chroma of 4 through 8. The upper part of the B2 horizon commonly has hue of 7.5YR. The B2 horizon is loam or clay loam.

The C horizon has hue of 2.5YR through 7.5YR, value of 3 through 5, and chroma of 4 through 8. It is loam, sandy clay loam, sandy loam, or their gravelly analogs.

Gilpin series

The Gilpin series consists of moderately deep, well drained soils formed in acid material weathered from interbedded shale, siltstone, and some sandstone. The Gilpin soils are on ridgetops, benches, and hillsides throughout the county. Slopes range from 3 to 55 percent.

Gilpin soils are on the landscape with well drained Upshur and Vandalia soils and moderately well drained Tilsit soils. Gilpin soils have less clay than the Upshur or Vandalia soils and are shallower to bedrock and do not have the reddish color typical of those soils. The Gilpin soils do not have the fragipan typical of the Tilsit soils.

Typical pedon of Gilpin silt loam, 40 to 55 percent slopes, in a wooded area west of Laurel Run Road about 2.5 miles south of West Virginia Route 47:

O2—1 inch to 0, decomposed leaf litter.
A1—0 to 3 inches, dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; friable; many roots; 10 percent coarse fragments; medium acid; clear wavy boundary.
B1—3 to 9 inches, yellowish brown (10YR 5/6) silty clay loam; weak fine and medium subangular blocky structure; friable; 15 percent coarse fragments; common roots; strongly acid; gradual wavy boundary.
B2t—9 to 20 inches, strong brown (7.5YR 5/6) channery silty clay loam; weak medium subangular blocky structure; friable; common roots; few discontinuous clay films on faces of peds; 30 percent coarse fragments; strongly acid; clear wavy boundary.
B3—20 to 29 inches, strong brown (7.5YR 5/6) channery loam; weak fine subangular blocky structure; friable; 40 percent coarse fragments; strongly acid; abrupt wavy boundary.
R—29 inches, sandstone and siltstone.

The solum thickness ranges from 20 to 36 inches, and the depth to bedrock is 20 to 40 inches. Coarse fragments of shale, siltstone, and sandstone make up 5 to 40 percent of individual subhorizons of the solum. Some pedons have a C horizon that is 30 to 70 percent coarse fragments. In unlimed areas the soils are strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 through 4.

The B horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 through 8. It is silt loam, silty clay loam, loam, or their channery or shaly analogs.

Hackers series

The Hackers series consists of deep, well drained soils formed in alluvial material washed from lime-influenced and acid soils on uplands. The Hackers soils are on high flood plains along the major streams in the county. Slopes range from 0 to 10 percent.

Hackers soils are on the landscape with well drained Moshannon soils, moderately well drained Senecaville soils, and poorly drained Melvin soils. Hackers soils are flooded less frequently than any of those soils.

Typical pedon of Hackers silt loam, 0 to 3 percent slopes, in a hayfield about 30 yards east of West Virginia Route 47 and 100 yards south of the bridge across the North Fork of the Hughes River:

Ap—0 to 8 inches, dark brown (7.5YR 4/2) silt loam; moderate medium granular structure; friable; many roots; slightly acid; clear smooth boundary.
B1—8 to 15 inches, reddish brown (5YR 4/4) silt loam; weak medium subangular blocky structure; friable; many roots; slightly acid; gradual wavy boundary.
B2t—15 to 38 inches, reddish brown (5YR 4/4) silty clay loam; weak medium and coarse prismatic structure parting to moderate medium subangular blocky; firm; few roots; common discontinuous clay films on faces of peds; medium acid; gradual wavy boundary.
B3—38 to 49 inches, reddish brown (5YR 4/4) silt loam; weak medium subangular blocky structure; friable; few roots; medium acid; gradual wavy boundary.
C—49 to 60 inches, reddish brown (5YR 4/4) silt loam; massive; very friable; medium acid.

The solum thickness ranges from 35 to 55 inches, and the depth to bedrock is more than 60 inches. The solum generally has no coarse fragments. Coarse fragments of gravel make up 0 to 10 percent of the C horizon. In unlimed areas the soils are slightly acid to strongly acid.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 through 4.

The B horizon has hue mainly of 5YR, value of 3 through 5, and chroma of 3 through 6. Subhorizons with hue of 7.5YR are in some pedons. The B horizon is silt loam or silty clay loam.

The C horizon has hue mainly of 5YR and value and chroma of 3 or 4. Subhorizons with hue of 7.5YR are in some pedons. The C horizon is dominantly silt loam or loam, but in some pedons it is stratified with silty clay loam, clay loam, or fine sandy loam.

Melvin series

The Melvin series consists of deep, poorly drained soils formed in alluvial material washed from lime-influenced and acid soils on uplands. The Melvin soils are on flood plains mainly along the major streams in the county. Slopes range from 0 to 5 percent.

Melvin soils are on the landscape with well drained Hackers, Moshannon, and Sensabaugh soils and moderately well drained Senecaville soils. The Melvin soils are flooded more frequently than the Hackers soils, have less gravel throughout than the Sensabaugh soils, and are grayer in the subsoil and substratum than either of those soils.

Typical pedon of Melvin silt loam, in a hayfield south of West Virginia Route 47, about 1 1/2 miles west of Smithville:

Ap—0 to 6 inches, brown (10YR 5/3) and light brownish gray (2.5Y 6/2) silt loam; few fine strong brown (7.5YR 5/6) mottles; moderate fine granular structure; friable; many roots; medium acid; abrupt smooth boundary.
B2g—6 to 20 inches, light gray (2.5YR 7/2) silt loam; common fine strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable; common roots; medium acid; clear wavy boundary.
Cg—20 to 60 inches, light brownish gray (2.5Y 6/2) silty clay loam; many medium strong brown (7.5YR 5/6) mottles; massive; firm; few roots; medium acid.

The solum thickness ranges from 20 to 40 inches, and the depth to bedrock is more than 60 inches. The content of coarse fragments of gravel ranges from 0 to 5 percent throughout. Reaction ranges from medium acid to neutral.

The A horizon has hue of 10YR or 2.5Y, value of 4 through 7, and chroma of 1 through 3.

The B2g and Cg horizons are neutral or have hue of 10YR or 2.5Y, value of 4 through 7, and chroma of 0 through 2. They are silt loam or silty clay loam.

Monongahela series

The Monongahela series consists of deep, moderately well drained soils formed in alluvial material washed mainly from acid soils on uplands. The Monongahela soils are on terraces along the major streams in the county. Slopes range from 3 to 20 percent.

Monongahela soils are on the landscape with well drained Gallia and Vandalia soils, but neither of those soils has a fragipan and the Monongahela soils have less clay than the Vandalia soils and do not have the reddish color typical of the Vandalia soils.

Typical pedon of Monongahela silt loam, in an area of Monongahela and Tilsit silt loams, 10 to 20 percent slopes, in a hayfield between Bunnell's Run and Route 12/2, about 1/2 mile northeast of the confluence of Bunnell's Run and the North Fork of the Hughes River:

Ap—0 to 8 inches, dark grayish brown (10YR 4/2) silt loam; moderate fine and medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.
B21t—8 to 19 inches, yellowish brown (10YR 5/6) silty clay loam; common fine and medium dark yellowish brown (10YR 3/6) mottles in lower part; moderate medium subangular blocky structure; friable; common roots; few discontinuous clay films on faces of peds; neutral; clear wavy boundary.
B22t—19 to 24 inches, yellowish brown (10YR 5/6) silty clay loam; many fine and medium strong brown (7.5YR 5/6) and grayish brown (10YR 5/2) mottles; moderate medium and coarse subangular blocky structure; common discontinuous clay films on faces of peds; friable; few roots; common fine black (10YR 2/1) concretions; strongly acid; abrupt smooth boundary.
Bx1—24 to 39 inches, strong brown (7.5YR 5/6) silty clay loam; many fine and medium grayish brown

(10YR 5/2) and dark yellowish brown (10YR 3/6) mottles; moderate very coarse prismatic structure parting to weak thick platy; very firm and brittle; common discontinuous clay films on faces of peds; many fine and medium black (10YR 2/1) concretions; very strongly acid; clear wavy boundary.

Bx2—39 to 48 inches, strong brown (7.5YR 5/6) gravelly silty clay loam; many fine and medium grayish brown (10YR 5/2) and dark yellowish brown (10YR 3/6) mottles; moderate very coarse prismatic structure; very firm and brittle; few discontinuous clay films on faces of peds; many fine and medium black (10YR 2/1) concretions; 30 percent coarse fragments; very strongly acid; gradual wavy boundary.

C—48 to 60 inches, strong brown (7.5YR 5/8) gravelly loam; many coarse red (2.5YR 4/8), light gray (7.5YR 7/0), yellowish red (5YR 5/6), and dark yellowish brown (10YR 3/6) mottles; massive; very firm; 40 percent coarse fragments; very strongly acid.

The solum thickness ranges from 40 to 72 inches. The depth to bedrock is more than 60 inches. The depth to the fragipan ranges from 20 to 28 inches. The content of coarse fragments of gravel ranges from 0 to 5 percent above the fragipan, 0 to 30 percent in the fragipan, and 10 to 40 percent in the C horizon. In unlimed areas the soils are strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 through 4.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 4 through 8. It is silt loam or silty clay loam.

The Bx horizon has hue of 7.5YR through 2.5Y, value of 5 or 6, and chroma of 2 through 6. It is silt loam, loam, clay loam, silty clay loam, or their gravelly analogs.

The C horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 2 through 8. It is loam, clay loam, sandy clay loam, or their gravelly analogs.

The Monongahela soils in this survey area are a taxadjunct to the Monongahela series because they dominantly are, by weight, less than 15 percent fine sand or coarser textured material, including fragments up to 7.5 centimeters in diameter in the textural control section. This difference does not affect use and management.

Moshannon series

The Moshannon series consists of deep, well drained soils formed in alluvial material washed from lime-influenced and acid soils on uplands. The Moshannon soils are on flood plains along major streams throughout the county. Slopes range from 0 to 3 percent.

Moshannon soils are on the landscape with well drained Hackers and Sensabaugh soils, moderately well drained Senecaville soils, and poorly drained Melvin soils. The Moshannon soils are flooded more frequently than the Hackers soils and have less gravel than the Sensabaugh soils.

Typical pedon of Moshannon silt loam, in a cornfield along the North Fork of the Hughes River about 400 feet east of Route 15, 3/4 mile north of Cisco:

Ap—0 to 9 inches, reddish brown (5YR 4/3) silt loam; moderate medium granular structure; very friable; many roots; medium acid; abrupt smooth boundary.

B1—9 to 15 inches, reddish brown (5YR 4/4) silt loam; weak medium subangular blocky structure; very friable; many roots; slightly acid; clear smooth boundary.

B2—15 to 26 inches, reddish brown (5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common roots; slightly acid; clear wavy boundary.

B3—26 to 41 inches, reddish brown (5YR 4/4) silt loam; weak medium subangular blocky structure; friable; few roots; slightly acid; gradual wavy boundary.

C—41 to 60 inches, reddish brown (5YR 4/4) silt loam; massive; friable; few roots; slightly acid.

The solum thickness ranges from 32 to 48 inches. The depth to bedrock is more than 60 inches. Coarse fragments of gravel make up 0 to 5 percent of the solum and 0 to 25 percent of the C horizon. In unlimed areas the soils are slightly acid or medium acid.

The A horizon has hue of 7.5YR or 5YR and value and chroma of 3 or 4.

The B horizon has hue of 5YR or 2.5YR and value and chroma of 3 or 4. It is dominantly silt loam or silty clay loam. Some pedons have thin strata of loam.

The C horizon has hue of 5YR or 2.5YR and value and chroma of 3 or 4. It is silt loam, loam, or their gravelly analogs.

Senecaville series

The Senecaville series consists of deep, moderately well drained soils formed in alluvial material washed from lime-influenced and acid soils on uplands. The Senecaville soils are on flood plains mainly along the major streams in the county. Slopes range from 0 to 5 percent.

Senecaville soils are on the landscape with well drained Hackers, Moshannon, and Sensabaugh soils and poorly drained Melvin soils. The Senecaville soils are flooded more frequently than the Hackers soils and have less gravel than the Sensabaugh soils.

Typical pedon of Senecaville silt loam, in a hayfield about 30 feet east of Cairo-Cisco Road and about 4 miles north of Cisco:

Ap—0 to 10 inches, reddish brown (5YR 4/3) silt loam; moderate fine granular and subangular blocky structure; friable; many roots; medium acid; abrupt smooth boundary.

B1—10 to 15 inches, yellowish red (5YR 5/6) silt loam; moderate medium subangular blocky structure; friable; common roots; strongly acid; clear wavy boundary.

B21—15 to 20 inches, yellowish red (5YR 5/6) silt loam; common fine and medium reddish gray (5YR 5/2) mottles; moderate medium and coarse subangular blocky structure; friable; few roots; few fine black concretions; strongly acid; clear wavy boundary.

B22—20 to 41 inches, yellowish red (5YR 4/6) and reddish yellow (5YR 6/8) silt loam; many fine and medium pinkish gray (5YR 7/2) and reddish gray (5YR 5/2) mottles; weak coarse prismatic structure parting to coarse subangular blocky; friable; few roots; many fine and medium black concretions; strongly acid; gradual wavy boundary.

C—41 to 60 inches, yellowish red (5YR 4/6) silt loam; many fine reddish yellow (5YR 6/8) and pinkish gray (5YR 7/2) mottles; massive; firm; many fine black concretions; strongly acid.

The solum thickness ranges from 32 to 45 inches. The depth to bedrock is more than 60 inches. Coarse fragments of gravel make up 0 to 5 percent of the solum and 0 to 15 percent of the C horizon. In unlimed areas the soils are slightly acid through strongly acid.

The A horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 2 through 4.

The B horizon has hue of 5YR, value of 4 or 5, and chroma of 4 through 6. It is silt loam or silty clay loam.

The C horizon dominantly has the same hue, value, and chroma as the B horizon, but in some pedons the hue is 7.5YR. The C horizon is silt loam or loam.

Sensabaugh series

The Sensabaugh series consists of deep, well drained soils formed in alluvial material washed from lime-influenced and acid soils on uplands. The Sensabaugh soils are on flood plains along small streams and on alluvial fans throughout the county. Slopes range from 0 to 5 percent.

Sensabaugh soils are on the landscape with well drained Moshannon and Vandalia soils, moderately well drained Senecaville soils, and poorly drained Melvin soils. The Sensabaugh soils have less clay than the Vandalia soils and are subject to flooding. They have more gravel than the Moshannon, Senecaville, or Melvin soils.

Typical pedon of Sensabaugh silt loam, in a pasture along Buffalo Run, about 3/4 mile north of its confluence with the North Fork of the Hughes River:

Ap—0 to 7 inches, dark brown (7.5YR 4/4) silt loam; moderate medium granular structure; very friable; many roots; medium acid; 10 percent coarse fragments; abrupt smooth boundary.

B2—7 to 22 inches, reddish brown (5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common roots; 10 percent coarse fragments; slightly acid; clear wavy boundary.

B3—22 to 26 inches, reddish brown (5YR 4/4) gravelly loam; weak medium subangular blocky structure; friable; few roots; 30 percent coarse fragments; medium acid; clear smooth boundary.

C—26 to 60 inches, reddish brown (5YR 5/6) very gravelly clay loam; massive; friable; few roots; 50 percent coarse fragments; slightly acid.

The solum thickness ranges from 24 to 40 inches, and the depth to bedrock is more than 60 inches. Coarse fragments of gravel make up 0 to 40 percent of individual subhorizons of the solum and 25 to 60 percent of the C horizon. Reaction ranges from medium acid to neutral.

The A horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 2 through 4. It is silt loam or loam.

The B horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 through 6. It is silt loam, loam, silty clay loam, or clay loam and is gravelly in the lower part. Mottles are in some pedons below a depth of 24 inches.

The C horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 through 6. It is gravelly or very gravelly analogs of loam, fine sandy loam, or clay loam.

Tilsit series

The Tilsit series consists of deep, moderately well drained soils formed in acid material weathered from interbedded shale, siltstone, and some sandstone. The soils are on ridgetops. Slopes range from 3 to 20 percent.

Tilsit soils are on the landscape with well drained Gilpin and Upshur soils. The Tilsit soils have a fragipan, which is not typical of the Gilpin or Upshur soils. The Tilsit soils are deeper and have fewer coarse fragments in the solum than the Gilpin soils, and they have less clay and do not have the reddish color typical of the Upshur soils.

Typical pedon of Tilsit silt loam, in a wooded area of Monongahela and Tilsit silt loams, 3 to 10 percent slopes, about 10 yards east of Route 16, 1/4 mile north of a cemetery and 1 mile southeast of Ellenboro:

O1—1/2 inch to 0, decomposed pine needles and matted, partially decomposed leaf remains.

A1—0 to 2 inches, dark grayish brown (2.5Y 4/2) silt loam; weak fine granular structure; friable; many roots; very strongly acid; abrupt smooth boundary.

A2—2 to 10 inches, light olive brown (2.5Y 5/4) silt loam; weak fine and medium subangular blocky structure; friable; many roots; very strongly acid; clear wavy boundary.

B21t—10 to 17 inches, light yellowish brown (2.5Y 6/4) silt loam; weak fine and medium subangular blocky structure; firm; few roots; few discontinuous clay films on faces of peds; very strongly acid; clear wavy boundary.

B22t—17 to 22 inches, light olive brown (2.5Y 5/6) silt loam; common medium grayish brown (2.5Y 5/2) mottles in lower part; weak medium subangular blocky structure; firm; few roots; common discontinuous clay films on faces of peds; very strongly acid; abrupt wavy boundary.

Bx1—22 to 33 inches, olive brown (2.5Y 4/4) silt loam; common coarse grayish brown (2.5Y 5/2) mottles; weak very coarse prismatic structure parting to weak medium subangular blocky; very firm and brittle; few discontinuous clay films on faces of prisms; few dark coatings; very strongly acid; gradual wavy boundary.

Bx2—33 to 41 inches, light yellowish brown (2.5Y 6/4) silt loam; common medium strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; weak very coarse prismatic structure; very firm and brittle; few discontinuous clay films on faces of prisms; very strongly acid; clear wavy boundary.

C—41 to 46 inches, light yellowish brown (10YR 6/4) silt loam; common medium light brownish gray (10YR 6/2) mottles; massive; very strongly acid; clear wavy boundary.

R—46 inches, sandstone.

The solum thickness ranges from 40 to 50 inches, and the depth to bedrock is 40 to 60 inches. The depth to the fragipan ranges from 20 to 28 inches. Coarse fragments of shale, siltstone, and some sandstone make up 0 to 10 percent of the solum and 10 to 50 percent of the C horizon. In unlimed areas the soils are strongly acid or very strongly acid.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 through 4.

The B2 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 through 8. It is silt loam or silty clay loam.

The Bx horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 4 through 8. It is silt loam or silty clay loam.

The C horizon has the same hue, value, and chroma as the B horizon. The C horizon is silt loam or silty clay loam or their shaly or channery counterparts.

Udorthents

Udorthents consist of a mixture of soil and rock material and very steep cut areas that have been drastically disturbed by man. Most of the Udorthents are along U.S. Route 50. Slopes range from nearly level to very steep.

Udorthents are on the landscape with Gilpin and Upshur soils on uplands, Vandalia soils on foot slopes, and Sensabaugh soils on flood plains.

Udorthents are highly variable, and thus a typical pedon is not given. Coarse fragments vary in size, kind, and amount. In most places the soil material is fill that was cut from the adjacent hillsides.

The depth to bedrock in the fill part of this unit is generally more than 60 inches. The content of coarse fragments ranges up to about 50 percent in the surface layer and 50 to 90 percent in the underlying horizons. Where unlimed, this material is medium acid to extremely acid.

The surface layer has hue of 10YR through 2.5YR and value and chroma of 4 through 6. It is silt loam, loam, clay loam, silty clay loam, or their very gravelly and channery or very channery analogs.

The underlying layers have hue of 10YR through 2.5YR, value of 4 through 6, and chroma of 2 through 8. They are loam, clay loam, silty clay loam, silty clay, or their channery or very channery analogs.

Upshur series

The Upshur series consists of deep, well drained soils formed in lime-influenced material weathered from shale and siltstone. The Upshur soils are throughout the county on ridgetops, benches, and hillsides. Slopes range from 3 to 55 percent.

Upshur soils are on the landscape with well drained Gilpin and Vandalia soils and moderately well drained Tilsit soils. The Upshur soils have more clay, are deeper to bedrock, and are redder than the Gilpin soils and have more clay in the upper part of the subsoil than the Vandalia soils. The Upshur soils do not have the fragipan typical of the Tilsit soils and are redder than the Tilsit soils.

Typical pedon of Upshur silty clay, 10 to 20 percent slopes, severely eroded, in a wooded area on a ridgetop east of Lamb Run Road, about 1 mile south of West Virginia Route 16:

Ap—0 to 6 inches, reddish brown (5YR 4/3) silty clay; moderate fine and medium granular and fine subangular blocky structure; friable; many roots; medium acid; clear wavy boundary.

B21t—6 to 15 inches, reddish brown (2.5YR 4/4) clay; strong medium subangular blocky structure; firm, very plastic, very sticky; common roots; continuous clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—15 to 24 inches, reddish brown (2.5YR 4/4) clay; strong medium angular blocky structure; firm, very plastic, very sticky; common roots; continuous clay films on faces of peds; 5 percent coarse fragments; strongly acid; gradual wavy boundary.

B3—24 to 41 inches, dark reddish brown (2.5YR 3/4) shaly clay; weak fine and medium subangular blocky structure; firm, very plastic, very sticky; 15 percent coarse fragments; medium acid; gradual wavy boundary.
C—41 to 56 inches, dark reddish brown (2.5YR 3/4) very shaly silty clay; massive; 60 percent coarse fragments; medium acid.
Cr—56 inches, red shale.

The solum thickness ranges from 26 to 44 inches. The depth to bedrock ranges from 40 to 60 inches. The content of coarse fragments, dominantly of soft shale and some siltstone, ranges from 0 to 10 percent in the A horizon and upper part of the B horizon, from 5 to 20 percent in the lower part of the B horizon, and from 20 to 60 percent in the C horizon. In unlimed areas the soils are very strongly acid to slightly acid in the solum and strongly acid to mildly alkaline in the C horizon.

The A horizon has hue of 7.5YR or 5YR and value and chroma of 2 through 4. It is silty clay loam or silty clay.

The B horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 3 through 6. The B2 horizon is silty clay or clay. The B3 horizon is silty clay, clay, or silty clay loam or their shaly analogs.

The C horizon has hue of 5YR through 10R, value of 3 or 4, and chroma of 3 through 6. It is shaly or very shaly analogs of silty clay loam, silty clay, or clay.

Vandalia series

The Vandalia series consists of deep, well drained soils on foot slopes. The soils formed in lime-influenced and acid colluvial material. The Vandalia soils are at the base of slopes and are along and around the heads of drainageways. Slopes range from 10 to 30 percent.

Vandalia soils are on the landscape with well drained Gallia, Gilpin, Sensabaugh, and Upshur soils and moderately well drained Monongahela soils. The Vandalia soils have more clay and less sand than the Gallia soils and are deeper to bedrock, have more clay, and are redder than the Gilpin soils. The Vandalia soils have more clay than the Sensabaugh soils and are not flooded. They have less clay in the upper part of the subsoil than the Upshur soils and have more clay and are redder than the Monongahela soils and do not have the fragipan typical of the Monongahela soils.

Typical pedon of Vandalia silt loam, 20 to 30 percent slopes, in a pasture on Bear Run about 300 yards northeast of the Middle Fork of the Hughes River, about 10 yards west of the road:

Ap—0 to 6 inches, dark reddish brown (5YR 3/4) silt loam; strong fine granular and subangular blocky structure; friable; many roots; 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.
B1—6 to 14 inches, yellowish red (5YR 4/6) silty clay loam; moderate medium subangular blocky structure; friable; many roots; 5 percent coarse fragments; very strongly acid; clear wavy boundary.
B21t—14 to 27 inches, yellowish red (5YR 4/6) silty clay loam; moderate coarse subangular blocky structure parting to moderate fine subangular blocky; firm, slightly plastic; common roots; common discontinuous clay films on faces of peds; 10 percent coarse fragments; very strongly acid; gradual wavy boundary.
B22t—27 to 34 inches, reddish brown (5YR 4/4) channery silty clay loam; moderate coarse subangular blocky structure parting to moderate fine subangular blocky; firm, slightly plastic; few roots; common discontinuous clay films on faces of peds; 15 percent coarse fragments; very strongly acid; gradual wavy boundary.
B23t—34 to 42 inches, dark reddish brown (2.5YR 3/4) channery silty clay loam; moderate medium and fine subangular blocky structure; firm, slightly plastic; common discontinuous clay films on faces of peds; few black concretions; 25 percent coarse fragments; strongly acid; gradual wavy boundary.
B3—42 to 50 inches, reddish brown (2.5YR 4/4) channery silty clay; common fine and medium red (2.5YR 5/8) mottles; moderate medium and fine subangular blocky structure; firm, plastic; common black concretions; 30 percent coarse fragments; strongly acid; gradual wavy boundary.
C—50 to 60 inches, dark reddish brown (2.5YR 3/4) channery silty clay; common fine and medium red (2.5YR 5/8) mottles; massive; firm, plastic; common black concretions; 30 percent coarse fragments; strongly acid.

The solum thickness ranges from 40 to 60 inches. The depth to bedrock is more than 60 inches. Coarse fragments of shale, siltstone, and sandstone make up 5 to 25 percent of the solum and 15 to 50 percent of the C horizon. In unlimed areas the soils are medium acid through very strongly acid in the upper part of the solum and are strongly acid through neutral in the lower part of the solum and in the C horizon.

The A horizon has hue of 10YR through 5YR, value of 4 or 5, and chroma of 2 through 4. It is silt loam or silty clay loam.

The B horizon has hue of 5YR or 2.5YR, value of 3 through 5, and chroma of 4 through 6. It is silty clay loam, silty clay, or their channery or shaly analogs.

The C horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 3 through 6. It is shaly or very shaly or channery or very channery analogs of clay, silty clay, silty clay loam, or clay loam.

Formation of the Soils

The origin and development of the soils of Ritchie County are given in this section. The five factors of soil formation and their influence on the soils are described, and the processes of horizon nomenclature development are explained.

Factors of Soil Formation

The formation of soil as a natural process is dependent upon the interaction of geological, biological, and climatic conditions over a period of time. Variations in these conditions and the parent materials available from place to place and time to time have resulted in the different soils of Ritchie County.

The five principal factors of soil formation are parent material, living organisms, climate, relief, and time. Each factor modifies the effectiveness of the others. Parent material, relief, and time have produced the major differences among the soils in the county. Climate and living organisms generally show their influence throughout broad areas, and their effects are relatively uniform throughout the county.

Parent Material, Topography, and Time

The physical and chemical properties of the parent material strongly influence the time required for soil formation and the nature of the soil produced. The soils of Ritchie County formed in residuum, alluvium, and colluvium.

Residual material weathered from interbedded shale, siltstone, sandstone, and some limestone is the parent material for about 85 percent of the soils in the county. For example, Gilpin soils formed in interbedded shale, siltstone, and fine-grained sandstone, and Upshur soils formed in lime-influenced shale and siltstone. About 10 percent of the soils formed in alluvium washed mainly from uplands that are underlain by interbedded shale, siltstone, and sandstone. Colluvial soils make up about 5 percent of the county. They formed in colluvial material that moved downslope, mostly from Gilpin and Upshur soils on uplands.

The residual material is the oldest parent material in the county, but the soil-forming factors in this material have been retarded by the resistance of the rock to weathering and the effect of slope on water movement. Consequently, some of the soils that formed from residual material are shallower than some of the soils formed in younger material.

Colluvial material is along foot slopes and around the head of drainageways. Vandalia soils, for example, formed in this colluvium.

Parent material of the flood plains and terraces was washed mainly from the Gilpin and Upshur soils on uplands. The soil-forming processes have had considerable time to act on the terrace material. Many additions, losses, and alterations have taken place. The resulting soils, such as Monongahela and Gallia soils, have a well-developed profile. The youngest parent material in the county is the alluvial deposits on the flood plains. The parent material on the flood plains lends itself very favorably to the interaction of the processes of soil formation. Hackers, Senecaville, Moshannon, Sensabaugh, and Melvin soils, for example, have not had as much time to develop as have the surrounding upland soils.

From an overall standpoint, climate is perhaps the most influential factor of soil formation. It determines, to a large degree, the nature of the weathering that occurs. For example, temperature and precipitation exert profound influences on the rates of chemical and physical processes—the essential means by which soil profile development is affected. Climate is generally uniform throughout the county. Therefore, it is not responsible for most main differences in the soils. A detailed description of climate is given in the section "General Nature of the Survey Area."

Living Organisms

All living organisms, including vegetation, animals, bacteria, and fungi, affect soil formation. The kind and amount of vegetation are generally responsible for the amount of organic matter, the color of the surface layer, and, in part, the amount of nutrients. Earthworms and burrowing animals help keep the soil open and porous, and they mix organic matter and mineral matter by moving the soil to the surface. Bacteria and fungi decompose organic matter, thus releasing nutrients for plant food. Man influences the characteristics of the surface layer by clearing the forest and by plowing.

Topography

The topography in Ritchie County affects soil formation through its effect on the amount of water moving through the soil, the amount and rate of surface runoff, and the rate of erosion.

Nearly level and gently sloping soils on residual materials and old stream terraces have had large amounts of water move through them. This condition favors the formation of deep soils that have well developed profiles, for example Tilsit, Gallia, and Monongahela soils.

On the steep hillsides, less water moves through the soil, the amount and rate of surface runoff is greater, and the soil material is washed away almost as rapidly as it forms. It is likely that the soils on these hillsides, mainly Gilpin and Upshur soils, will remain shallower to bedrock than will the soils on more gentle slopes.

Topography is favorable for formation of soils on flood plains, and formation of soils on flood plains is progressing at a rapid rate. Soils on flood plains are weakly developed, however, because so little time has elapsed since the materials were deposited.

Horizon Development

The results of the soil-forming factors can be distinguished by the different layers, or soil horizons, in a soil profile. The soil profile extends downward to materials that have been little altered by the soil-forming processes.

Most soils in Ritchie County contain three major horizons, called A, B, and C horizons. These major horizons may be further subdivided by the use of numbers and letters to indicate changes within one horizon. An example is the B2t horizon, which represents a B horizon that contains an accumulation of translocated clay.

The A horizon is the surface layer. It is the horizon of maximum accumulation of organic matter. It is also the horizon of maximum leaching, or eluviation, of clay and iron.

The B horizon underlies the A horizon and is commonly called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds leached from the surface layer. The B horizon commonly has blocky structure and is generally more firm and lighter in color than the A horizon.

The C horizon is below the A and B horizons. It consists of material that is modified by weathering but is altered little by the soil-forming processes.

In Ritchie County, many processes are involved in the formation of soil horizons. The more important of these are the accumulation of organic matter, the leaching of soluble salts, the reduction and transfer of iron, the formation and translocation of clay minerals, and the formation of soil structure. These processes are continually taking place and have been for thousands of years.

Most of the well drained and moderately well drained soils in the county have a yellowish brown or reddish brown subsoil. The colors are due mainly to the iron oxide coatings on sand grains and silt. The colors of the subsoil of Upshur and Vandalia soils and bottom-land soils, such as Moshannon, Hackers, Senecaville, and Sensabaugh soils, are inherited from the reddish parent material from which they formed. The B horizon of most of these soils has blocky structure.

A fragipan has developed in the subsoil of moderately well drained Tilsit and Monongahela soils which are on uplands and older stream terraces. This horizon is dense, firm, and brittle when moist and is hard when dry. It is mottled, has prismatic structure, and is moderately slowly permeable or slowly permeable to water and air. Most fragipans have a grayish color that is caused by the intense reduction of iron. This process of reduction of iron during soil formation is called gleying.

In poorly drained Melvin soils on flood plains, the subsoil and underlying material are grayish, which indicates reduction of iron.

References

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) United States Department of Agriculture, 1978. The forest resources of West Virginia. For. Serv. Res. Bull. NE-56, 105 pp., illus.

(4) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]

(5) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(6) West Virginia Geological Survey, 1956. Geology and economic resources of the Ohio River Valley in West Virginia. 22 vol. 404 pp., illus.

Glossary

ABC soil. A soil having an A, a B, and a C horizon.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2.4
Low	2.4-3.2
Moderate	3.2-5.2
High	>5.2

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench. A gently inclined strip or platform of land bounded by steeper slopes above and below and formed by erosion of rocks of varying resistance or by a change of base-level erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A form of noninversion tillage that retains protective amounts of residue mulch on the surface throughout the year. It includes no-tillage, strip tillage, stubble mulching, and other types of noninversion tillage.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.
A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive

characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data were recorded in the period 1951-73 at Cairo, W. Va.]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days[1]	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	42.6	20.0	31.3	71	-12	38	3.18	2.06	4.20	8	8.1
February---	45.6	22.4	34.1	69	-7	68	2.65	1.28	3.83	7	4.7
March------	57.1	29.9	43.5	85	8	196	3.87	1.68	5.72	9	2.1
April------	67.5	38.0	52.7	87	20	381	3.93	2.44	5.27	9	.1
May--------	77.2	46.6	61.9	92	28	679	4.04	2.50	5.41	8	.0
June-------	84.4	55.9	70.2	96	39	906	3.92	2.20	5.43	7	.0
July-------	86.9	60.5	73.7	97	45	1,045	4.97	3.10	6.65	8	.0
August-----	85.7	59.5	72.6	96	43	1,011	3.95	2.32	5.39	7	.0
September--	80.8	52.8	66.8	94	31	804	3.26	1.57	4.72	6	.0
October----	71.6	40.9	56.3	86	24	505	2.48	.96	3.74	6	.0
November---	56.8	31.6	44.2	80	10	148	2.85	1.74	3.84	7	1.5
December---	45.9	24.1	35.0	73	-3	111	2.86	1.32	4.17	7	3.6
Yearly:											
Average--	66.8	40.2	53.5	---	---	---	---	---	---	---	---
Extreme--	---	---	---	98	-15	---	---	---	---	---	---
Total----	---	---	---	---	---	5,892	41.96	37.14	49.13	89	20.1

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1951-73 at Cairo, W. Va.]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 24	May 5	May 19
2 years in 10 later than--	April 19	May 1	May 14
5 years in 10 later than--	April 9	April 22	May 4
First freezing temperature in fall:			
1 year in 10 earlier than--	October 19	October 1	September 18
2 years in 10 earlier than--	October 23	October 6	September 24
5 years in 10 earlier than--	November 1	October 17	October 4

TABLE 3.--GROWING SEASON

[Data were recorded in the period 1951-73 at Cairo, W. Va.]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	185	158	130
8 years in 10	192	165	138
5 years in 10	205	177	152
2 years in 10	218	190	167
1 year in 10	225	196	175

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
GaB	Gallia silt loam, 3 to 10 percent slopes	270	0.1
GaC	Gallia silt loam, 10 to 20 percent slopes	390	0.1
GlC	Gilpin silt loam, 10 to 20 percent slopes	1,310	0.5
GlD	Gilpin silt loam, 20 to 30 percent slopes	2,040	0.7
GlD3	Gilpin silt loam, 20 to 30 percent slopes, severely eroded	300	0.1
GlE	Gilpin silt loam, 30 to 40 percent slopes	2,080	0.7
GlF	Gilpin silt loam, 40 to 55 percent slopes	6,780	2.3
GuE	Gilpin-Upshur complex, 30 to 40 percent slopes	34,020	11.8
GuE3	Gilpin-Upshur complex, 30 to 40 percent slopes, severely eroded	23,440	8.1
GuF	Gilpin-Upshur complex, 40 to 55 percent slopes	47,060	16.3
GuF3	Gilpin-Upshur complex, 40 to 55 percent slopes, severely eroded	21,670	7.5
GvF	Gilpin-Upshur complex, stony, 30 to 55 percent slopes	9,000	3.1
HaA	Hackers silt loam, 0 to 3 percent slopes	950	0.3
HaB	Hackers silt loam, 3 to 10 percent slopes	590	0.2
Me	Melvin silt loam	240	0.1
MnB	Monongahela and Tilsit silt loams, 3 to 10 percent slopes	2,920	1.0
MnC	Monongahela and Tilsit silt loams, 10 to 20 percent slopes	4,490	1.6
MnC3	Monongahela and Tilsit silt loams, 10 to 20 percent slopes, severely eroded	810	0.3
Mo	Moshannon silt loam	5,770	2.0
Se	Senecaville silt loam	1,720	0.6
Sn	Sensabaugh silt loam	8,500	2.9
Ua	Udorthents, smooth	1,440	0.5
UbB	Upshur silty clay loam, 3 to 10 percent slopes	260	0.1
UbC	Upshur silty clay loam, 10 to 20 percent slopes	880	0.3
UbD	Upshur silty clay loam, 20 to 30 percent slopes	450	0.2
UcC3	Upshur silty clay, 10 to 20 percent slopes, severely eroded	1,480	0.5
UcD3	Upshur silty clay, 20 to 30 percent slopes, severely eroded	400	0.1
UgB	Upshur-Gilpin complex, 3 to 10 percent slopes	570	0.2
UgC	Upshur-Gilpin complex, 10 to 20 percent slopes	13,080	4.5
UgC3	Upshur-Gilpin complex, 10 to 20 percent slopes, severely eroded	4,720	1.6
UgD	Upshur-Gilpin complex, 20 to 30 percent slopes	48,220	16.7
UgD3	Upshur-Gilpin complex, 20 to 30 percent slopes, severely eroded	34,000	11.8
VaC	Vandalia silt loam, 10 to 20 percent slopes	2,030	0.7
VaD	Vandalia silt loam, 20 to 30 percent slopes	2,840	1.0
VdC3	Vandalia silty clay loam, 10 to 20 percent slopes, severely eroded	310	0.1
VdD3	Vandalia silty clay loam, 20 to 30 percent slopes, severely eroded	3,250	1.1
	Water	1,000	0.3
	Total	289,280	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Oats	Wheat	Grass-legume hay	Alfalfa hay	Kentucky bluegrass
	Bu	Bu	Bu	Ton	Ton	AUM*
GaB: Gallia	115	70	45	3.5	4.5	5.5
GaC: Gallia	100	65	40	3.0	4.0	5.0
GlC: Gilpin	85	60	35	3.0	3.5	4.5
GlD: Gilpin	80	55	30	2.5	3.0	4.0
GlD3, GlE: Gilpin	---	---	---	---	---	3.5
GlF: Gilpin	---	---	---	---	---	---
GuE: Gilpin-Upshur	---	---	---	---	---	3.5
GuE3, GuF, GuF3, GvF: Gilpin-Upshur	---	---	---	---	---	---
HaA: Hackers	135	80	50	3.5	5.0	5.5
HaB: Hackers	130	80	50	3.5	5.0	5.5
Me: Melvin	100	60	---	3.5	---	4.5
MnB: Monongahela and Tilsit	107	65	40	3.0	3.5	4.5
MnC: Monongahela and Tilsit	90	60	35	3.0	3.0	4.5
MnC3: Monongahela and Tilsit	85	60	35	2.5	3.0	4.0
Mo: Moshannon	130	80	45	3.5	5.0	5.5
Se: Senecaville	130	80	45	3.5	4.5	5.5
Sn: Sensabaugh	120	70	45	3.5	4.5	5.5
Ua**. Udorthents						
UbB: Upshur	95	65	40	3.0	4.0	4.5
UbC: Upshur	90	60	35	3.0	4.0	4.5
UbD: Upshur	---	---	---	---	---	4.0

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Wheat	Grass-legume hay	Alfalfa hay	Kentucky bluegrass
	Bu	Bu	Bu	Ton	Ton	AUM*
UcC3----------------------- Upshur	---	---	---	---	---	4.0
UcD3----------------------- Upshur	---	---	---	---	---	---
UgB------------------------ Upshur-Gilpin	95	65	40	3.0	3.7	4.5
UgC------------------------ Upshur-Gilpin	90	60	35	3.0	3.7	4.5
UgC3, UgD------------------ Upshur-Gilpin	85	60	35	3.0	3.7	4.0
UgD3----------------------- Upshur-Gilpin	---	---	---	---	---	4.0
VaC------------------------ Vandalia	100	60	35	3.0	4.5	4.5
VaD, VdC3------------------ Vandalia	90	55	30	2.5	4.0	4.0
VdD3----------------------- Vandalia	---	---	---	---	---	3.5

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	950	---	---	---
II	20,340	4,350	15,990	---
III	21,800	21,560	240	---
IV	59,820	59,820	---	---
V	---	---	---	---
VI	75,580	75,580	---	---
VII	108,350	99,350	---	9,000
VIII	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
GaB, GaC: Gallia	1o	Slight	Slight	Slight	Moderate	White oak Northern red oak Yellow-poplar Black walnut Black cherry Sugar maple White ash	85 95 95 --- --- --- ---	Eastern white pine, red pine, yellow-poplar, black walnut, white ash, white oak.
GlC: Gilpin	2o	Slight	Slight	Slight	Moderate	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
GlD, GlD3, GlE: Gilpin (North aspect)	2r	Moderate	Moderate	Slight	Moderate	Northern red oak Yellow poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
GlD, GlD3, GlE: Gilpin (South aspect)	3r	Moderate	Moderate	Moderate	Moderate	Northern red oak Yellow-poplar	70 90	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
GlF: Gilpin (North aspect)	2r	Severe	Severe	Slight	Moderate	Northern red oak Yellow-poplar	80 95	Japanese larach, Virginia pine, eastern white pine, black cherry, yellow-poplar.
GlF: Gilpin (South aspect)	3r	Severe	Severe	Moderate	Moderate	Northern red oak Yellow-poplar	70 90	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
GuE*, GuE3*:								
Gilpin (North aspect)	2r	Moderate	Moderate	Slight	Moderate	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
Upshur (North aspect)	3c	Severe	Severe	Slight	Severe	Northern red oak Yellow-poplar Eastern white pine Virginia pine	70 90 90 70	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.
GuE*, GuE3*:								
Gilpin (South aspect)	3r	Moderate	Moderate	Moderate	Moderate	Northern red oak Yellow-poplar	70 90	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
Upshur (South aspect)	4c	Severe	Severe	Slight	Moderate	Northern red oak Eastern white pine Virginia pine	65 75 60	Virginia pine, eastern white pine, shortleaf pine, eastern redcedar.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
GuF, GuF3, GvF:								
Gilpin (North aspect)	2r	Severe	Severe	Slight	Moderate	Northern red oak	80	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar	95	
Upshur (North aspect)	3c	Severe	Severe	Slight	Moderate	Northern red oak	70	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.
						Yellow-poplar	90	
						Eastern white pine	90	
GuF, GuF3*, GvF*:								
Gilpin (South aspect)	3r	Severe	Severe	Moderate	Moderate	Northern red oak	70	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar	90	
Upshur (South aspect)	4c	Severe	Severe	Slight	Moderate	Northern red oak	65	Virginia pine, eastern white pine, shortleaf pine, eastern redcedar.
						Eastern white pine	75	
						Virginia pine	60	
HaA, HaB Hackers	1o	Slight	Slight	Slight	Severe	Northern red oak	85	Eastern white pine, black walnut, yellow-poplar, Norway spruce.
						Yellow-poplar	95	
						White ash	85	
Me Melvin	1w	Slight	Severe	Severe	Severe	Pin oak	95	Pin oak, American sycamore, sweetgum, loblolly pine.
						Sweetgum	---	
						Red maple	---	
						Sycamore	---	
MnB*:								
Monongahela	3o	Slight	Slight	Slight	Severe	Northern red oak	70	Eastern white pine, Virginia pine, Japanese larch.
						Yellow-poplar	85	
						Eastern white pine	72	
						Virginia pine	66	
						White ash	---	
						Black walnut	---	
Tilsit	3o	Slight	Slight	Slight	Moderate	Northern red oak	70	Eastern white pine, Virginia pine, shortleaf pine.
						Yellow-poplar	89	
						Eastern white pine	80	
						Virginia pine	70	
						Shortleaf pine	78	
MnC*, MnC3*:								
Monongahela	3o	Moderate	Slight	Slight	Severe	Northern red oak	70	Eastern white pine, Virginia pine, Japanese larch.
						Yellow-poplar	85	
						Eastern white pine	72	
						Virginia pine	66	
						White ash	---	
						Black walnut	---	
Tilsit	3o	Slight	Slight	Slight	Moderate	Northern red oak	70	Eastern white pine, Virginia pine, shortleaf pine.
						Yellow-poplar	89	
						Eastern white pine	80	
						Virginia pine	70	
						Shortleaf pine	78	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Mo----------------- Moshannon	1o	Slight	Slight	Slight	Moderate	Northern red oak---- Yellow-poplar------- Sugar maple--------- Black walnut--------	85 95 85 ---	Eastern white pine, black walnut, yellow-poplar, white ash, Norway spruce.
Se----------------- Senecaville	1o	Slight	Slight	Slight	Severe	Northern red oak---- Yellow-poplar------- White ash----------- White oak-----------	85 95 85 85	Eastern white pine, yellow-poplar, Norway spruce, Japanese larch.
Sn----------------- Sensabaugh	2o	Slight	Slight	Slight	Severe	Yellow-poplar------- White oak----------- Shortleaf pine------ Virginia pine-------	100 80 80 75	Yellow-poplar, black walnut, loblolly pine.
UbB---------------- Upshur	3c	Moderate	Severe	Slight	Severe	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine-------	65 80 80 66	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.
UbC---------------- Upshur	3c	Severe	Severe	Slight	Severe	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine-------	65 80 80 66	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.
UbD---------------- Upshur (North aspect)	3c	Severe	Severe	Slight	Severe	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine-------	70 90 90 70	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.
UbD---------------- Upshur (South aspect)	4c	Severe	Severe	Slight	Moderate	Northern red oak---- Eastern white pine-- Virginia pine-------	65 75 60	Virginia pine, eastern white pine, shortleaf pine, eastern redcedar.
UcC3--------------- Upshur	3c	Severe	Severe	Slight	Severe	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine-------	65 80 80 66	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.
UcD3--------------- Upshur (North aspect)	3c	Severe	Severe	Slight	Severe	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine-------	70 90 90 70	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.
UcD3--------------- Upshur (South aspect)	4c	Severe	Severe	Slight	Moderate	Northern red oak---- Eastern white pine-- Virginia pine-------	65 75 60	Virginia pine, eastern white pine, shortleaf pine, eastern redcedar.
UgB*:								
Upshur------------	3c	Moderate	Severe	Slight	Moderate	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine-------	65 80 80 66	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.
Gilpin------------	2o	Slight	Slight	Slight	Moderate	Northern red oak---- Yellow-poplar-------	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
UgC*, UgC3*:								
Upshur------------	3c	Severe	Severe	Slight	Moderate	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine-------	65 80 80 66	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
UgC*, UgC3*: Gilpin	2o	Slight	Slight	Slight	Moderate	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
UgD, UgD3*: Upshur (North aspect)	3c	Severe	Severe	Slight	Severe	Northern red oak Yellow-poplar Eastern white pine Virginia pine	70 90 90 70	Eastern white pine, Virginia pine, shortleaf pine, yellow-poplar.
Gilpin (North aspect)	2r	Moderate	Moderate	Slight	Moderate	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
UgD, UgD3*: Upshur (South aspect)	4c	Severe	Severe	Slight	Moderate	Northern red oak Eastern white pine Virginia pine	65 75 60	Virginia pine, eastern white pine, shortleaf pine, eastern redcedar.
Gilpin (South aspect)	3r	Moderate	Moderate	Moderate	Moderate	Northern red oak Yellow-poplar	70 90	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
VaC Vandalia	3c	Moderate	Moderate	Slight	Severe	Northern red oak Yellow-poplar Virginia pine	73 75 70	Eastern white pine, Virginia pine, yellow-poplar, black walnut.
VaD Vandalia (North aspect)	2c	Severe	Severe	Slight	Severe	Northern red oak Yellow-poplar Virginia pine	77 90 80	Eastern white pine, Virginia pine, yellow-poplar, black walnut.
VaD Vandalia (South aspect)	3c	Severe	Severe	Slight	Severe	Northern red oak Yellow-poplar Virginia pine	68 75 70	Eastern white pine, Virginia pine, yellow-poplar, black walnut.
VdC3 Vandalia	3c	Moderate	Moderate	Slight	Severe	Northern red oak Yellow-poplar Virginia pine	73 75 70	Eastern white pine, Virginia pine, yellow-poplar, black walnut.
VdD3 Vandalia (North aspect)	2c	Severe	Severe	Slight	Severe	Northern red oak Yellow-poplar Virginia pine	77 90 80	Eastern white pine, Virginia pine, yellow-poplar, black walnut.
VdD3 Vandalia (South aspect)	3c	Severe	Severe	Slight	Severe	Northern red oak Yellow-poplar Virginia pine	68 75 70	Eastern white pine, Virginia pine, yellow-poplar, black walnut.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
GaB: Gallia	Slight	Slight	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
GaC: Gallia	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
GlC: Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
GlD, GlD3: Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
GlE, GlF: Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GuE*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
GuE3*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey, erodes easily.	Severe: slope, too clayey.
GuF*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
GuF3*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey, erodes easily.	Severe: slope, too clayey.
GvF*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope, small stones, large stones.	Severe: slope.	Severe: slope.
Upshur	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope, erodes easily.	Severe: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HaA: Hackers	Severe: flooding.	Slight	Slight	Slight	Slight.
HaB: Hackers	Severe: flooding.	Slight	Moderate: slope.	Slight	Slight.
Me: Melvin	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
MnB*:					
Monongahela	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
Tilsit	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
MnC*, MnC3*:					
Monongahela	Moderate: wetness, slope, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Tilsit	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, wetness.
Mo: Moshannon	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Se: Senecaville	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding.	Slight	Moderate: flooding.
Sn: Sensabaugh	Severe: flooding.	Slight	Moderate: slope, small stones, flooding.	Slight	Moderate: flooding.
Ua*. Udorthents					
UbB: Upshur	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
UbC: Upshur	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
UbD: Upshur	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
UcC3: Upshur	Severe: too clayey.	Severe: too clayey.	Severe: slope, too clayey.	Severe: too clayey, erodes easily.	Severe: too clayey.
UcD3: Upshur	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: too clayey, erodes easily.	Severe: slope, too clayey.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
UgB*:					
Upshur	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
Gilpin	Slight	Slight	Moderate: small stones, slope.	Slight	Moderate: thin layer.
UgC*:					
Upshur	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
UgC3*:					
Upshur	Severe: too clayey.	Severe: too clayey.	Severe: slope, too clayey.	Severe: too clayey, erodes easily.	Severe: too clayey.
Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
UgD*:					
Upshur	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
UgD3*:					
Upshur	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: too clayey, erodes easily.	Severe: slope, too clayey.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
VaC Vandalia	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
VaD Vandalia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
VdC3 Vandalia	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
VdD3 Vandalia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
GaB: Gallia	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GaC: Gallia	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GlC: Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
GlD, GlD3: Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
GlE: Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
GlF: Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
GuE*, GuE3*:										
Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Upshur	Very poor.	Fair	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
GuF*, GuF3*:										
Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Upshur	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
GvF*:										
Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Upshur	Very poor.	Very poor.	Fair	Good	Good	Very poor.	Very poor.	Very poor.	Fair	Very poor.
HaA: Hackers	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HaB: Hackers	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Me: Melvin	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
MnB*:										
Monongahela	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Tilsit	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MnC*, MnC3*:										
Monongahela	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Tilsit	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Mo-----------------Moshannon	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Se-----------------Senecaville	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Sn-----------------Sensabaugh	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ua*. Udorthents										
UbB----------------Upshur	Fair	Good	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
UbC----------------Upshur	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
UbD----------------Upshur	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
UcC3---------------Upshur	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
UcD3---------------Upshur	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
UgB*:										
Upshur------------	Fair	Good	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Gilpin------------	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
UgC*, UgC3*:										
Upshur------------	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin------------	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
UgD*, UgD3*:										
Upshur------------	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin------------	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
VaC----------------Vandalia	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
VaD----------------Vandalia	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
VdC3---------------Vandalia	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
VdD3---------------Vandalia	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
GaB----------------Gallia	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength.	Slight.
GaC----------------Gallia	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
GlC----------------Gilpin	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.	Moderate: slope, thin layer.
GlD, GlD3, GlE, GlF---------------Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GuE*:						
Gilpin------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur------------	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, low strength, slippage.	Severe: slope.
GuE3*:						
Gilpin------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur------------	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, low strength, slippage.	Severe: slope, too clayey.
GuF*:						
Gilpin------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur------------	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, low strength, slippage.	Severe: slope.
GuF3*:						
Gilpin------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur------------	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, low strength, slippage.	Severe: slope, too clayey.
GvF*:						
Gilpin------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur------------	Severe: slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, slope, slippage.	Severe: low strength, slope, shrink-swell, slippage.	Severe: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
HaA, HaB---------- Hackers	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength. flooding.	Slight.
Me---------------- Melvin	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
MnB*: Monongahela------	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness.	Slight.
Tilsit-----------	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength.	Moderate: wetness.
MnC*, MnC3*: Monongahela------	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: slope, low strength, wetness.	Moderate: slope.
Tilsit-----------	Severe: wetness.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope, wetness.
Mo---------------- Moshannon	Moderate: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Se---------------- Senecaville	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Sn---------------- Sensabaugh	Moderate: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Ua*. Udorthents						
UbB--------------- Upshur	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
UbC--------------- Upshur	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, low strength.	Moderate: slope.
UbD--------------- Upshur	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, low strength, slippage.	Severe: slope.
UcC3-------------- Upshur	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, low strength.	Severe: too clayey.
UcD3-------------- Upshur	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, low strength, slippage.	Severe: slope, too clayey.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
UgB*: Upshur	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Gilpin	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate	Moderate: thin layer.
UgC*: Upshur	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, low strength.	Moderate: slope.
Gilpin	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.	Moderate: slope, thin layer.
UgC3*: Upshur	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, low strength.	Severe: too clayey.
Gilpin	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.	Moderate: slope, thin layer.
UgD*: Upshur	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, low strength, slippage.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
UgD3*: Upshur	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, low strength, slippage.	Severe: slope, too clayey.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VaC: Vandalia	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope, slippage.	Severe: low strength, shrink-swell.	Moderate: slope.
VaD: Vandalia	Severe: slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, slope, slippage.	Severe: low strength, slope, shrink-swell, slippage.	Severe: slope.
VdC3: Vandalia	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope, slippage.	Severe: low strength, shrink-swell.	Moderate: slope.
VdD3: Vandalia	Severe: slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, slope, slippage.	Severe: low strength, slope, shrink-swell, slippage.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GaB------------------ Gallia	Slight-----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey, small stones.
GaC------------------ Gallia	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
GlC------------------ Gilpin	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
GlD, GlD3, GlE, GlF- Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
GuE*, GuE3*, GuF*, GuF3*:					
Gilpin-------------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
Upshur-------------	Severe: slope, percs slowly, slippage.	Severe: slope.	Severe: slope, too clayey, slippage.	Severe: slope, slippage.	Poor: slope, too clayey, hard to pack.
GvF*:					
Gilpin--------------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Poor: slope, area reclaim, large stones.
Upshur--------------	Severe: percs slowly, slope, slippage.	Severe: slope.	Severe: slippage, slope, too clayey.	Severe: slope, slippage.	Poor: hard to pack, slope.
HaA, HaB------------- Hackers	Moderate: flooding.	Severe: flooding.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
Me------------------- Melvin	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
MnB*:					
Monongahela---------	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Fair: small stones, wetness.
Tilsit--------------	Severe: percs slowly, wetness.	Severe: wetness.	Severe: depth to rock, wetness.	Moderate: wetness, depth to rock.	Fair: area reclaim, wetness.
MnC*, MnC3*:					
Monongahela---------	Severe: percs slowly, wetness.	Severe: slope, wetness.	Moderate: slope, wetness.	Moderate: slope, wetness.	Fair: small stones, wetness, slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MnC*, MnC3*:					
Tilsit	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: depth to rock, wetness.	Moderate: slope, wetness, depth to rock.	Fair: slope, wetness, area reclaim.
Mo Moshannon	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Good.
Se Senecaville	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Sn Sensabaugh	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Poor: small stones.
Ua*. Udorthents					
UbB Upshur	Severe: percs slowly.	Moderate: slope, depth to rock.	Severe: too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
UbC Upshur	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
UbD Upshur	Severe: slope, percs slowly, slippage.	Severe: slope.	Severe: slope, too clayey, slippage.	Severe: slope, slippage.	Poor: slope, too clayey, hard to pack.
UcC3 Upshur	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
UcD3 Upshur	Severe: slope, percs slowly, slippage.	Severe: slope.	Severe: slope, too clayey, slippage.	Severe: slope, slippage.	Poor: slope, too clayey, hard to pack.
UgB*:					
Upshur	Severe: percs slowly.	Moderate: slope, depth to rock.	Severe: too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
Gilpin	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
UgC*, UgC3*:					
Upshur	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Gilpin	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
UgD*, UgD3*:					
Upshur	Severe: slope, percs slowly, slippage.	Severe: slope.	Severe: slope, too clayey, slippage.	Severe: slope, slippage.	Poor: slope, too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
UgD*, UgD3*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
VaC: Vandalia	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
VaD: Vandalia	Severe: slope, percs slowly, slippage.	Severe: slope.	Severe: slope, too clayey, slippage.	Severe: slope, slippage.	Poor: too clayey, hard to pack, slope.
VdC3: Vandalia	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
VdD3: Vandalia	Severe: slope, percs slowly, slippage.	Severe: slope.	Severe: slope, too clayey, slippage.	Severe: slope, slippage.	Poor: too clayey, hard to pack, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
GaB, GaC------------- Gallia	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
GlC------------------ Gilpin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
GlD, GlD3------------ Gilpin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
GlE, GlF------------- Gilpin	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
GuE*, GuE3*, GuF*, GuF3*:				
Gilpin--------------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Upshur--------------	Poor: slope, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
GvF*:				
Gilpin--------------	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Upshur--------------	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
HaA, HaB------------- Hackers	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Me------------------- Melvin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
MnB*:				
Monongahela---------	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Tilsit--------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MnC*, MnC3*:				
Monongahela---------	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
Tilsit--------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
Mo------------------- Moshannon	Poor: frost action.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Se: Senecaville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Sn: Sensabaugh	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Ua*. Udorthents				
UbB, UbC: Upshur	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
UbD: Upshur	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
UcC3: Upshur	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
UcD3: Upshur	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
UgB*, UgC*, UgC3*:				
Upshur	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Gilpin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
UgD*, UgD3*:				
Upshur	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Gilpin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
VaC: Vandalia	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
VaD: Vandalia	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, thin layer.
VdC3: Vandalia	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
VdD3: Vandalia	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, thin layer.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
GaB: Gallia	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Erodes easily	Erodes easily.
GaC: Gallia	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
GlC, GlD, GlD3, GlE, GlF: Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
GuE*, GuE3*, GuF*, GuF3*:					
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Upshur	Severe: slope, slippage.	Severe: hard to pack.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
GvF*:					
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Upshur	Severe: slope, slippage.	Severe: hard to pack.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
HaA: Hackers	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
HaB: Hackers	Moderate: seepage, slope.	Severe: piping.	Deep to water	Favorable	Favorable.
Me: Melvin	Moderate: seepage.	Severe: piping, wetness.	Flooding	Erodes easily, wetness.	Wetness, erodes easily.
MnB*:					
Monongahela	Moderate: seepage, slope.	Severe: piping.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
Tilsit	Moderate: depth to rock, seepage, slope.	Severe: piping.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
MnC*, MnC3*:					
Monongahela	Severe: slope.	Severe: piping.	Percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Tilsit	Severe: slope.	Severe: piping.	Percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Mo: Moshannon	Moderate: seepage.	Severe: piping.	Flooding	Favorable	Favorable.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Terraces and diversions	Grassed waterways
Se: Senecaville	Moderate: seepage.	Severe: piping.	Flooding	Wetness	Favorable.
Sn: Sensabaugh	Severe: seepage.	Moderate: large stones.	Flooding	Large stones	Large stones.
Ua*. Udorthents					
UbB: Upshur	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
UbC, UbD, UcC3, UcD3: Upshur	Severe: slope, slippage.	Severe: hard to pack.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
UgB*:					
Upshur	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Gilpin	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, large stones.	Depth to rock, large stones.
UgC*, UgC3*, UgD*, UgD3*:					
Upshur	Severe: slope, slippage.	Severe: hard to pack.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
VaC, VaD, VdC3, VdD3: Vandalia	Severe: slope, slippage.	Moderate: hard to pack.	Deep to water	Slope, erodes easily.	Slope, erodes easily, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
GaB, GaC--------- Gallia	0-15	Silt loam--------	ML, CL, CL-ML	A-4	0	100	85-100	75-95	60-85	22-35	3-10
	15-67	Sandy clay loam, gravelly clay loam, loam.	CL, SC	A-6	0	85-100	70-100	60-95	35-70	32-40	13-20
	67-72	Loamy sand, gravelly loamy sand, sandy loam.	SM	A-2, A-1	0-5	75-100	65-95	45-70	15-35	---	NP
GlC, GlD, GlD3, GlE, GlF-------- Gilpin	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-20	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	20-29	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC, SM,SC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GuE*: Gilpin----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-20	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	20-29	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC, SM, SC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Upshur----------	0-6	Silty clay loam	CL, ML	A-6, A-7	0	95-100	95-100	90-100	80-95	35-50	11-25
	6-41	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	41-56	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	56	Weathered bedrock	---	---	---	---	---	---	---	---	---
GuE3*: Gilpin----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-20	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	20-29	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC, SM, SC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Upshur----------	0-6	Silty clay-------	MH, ML, CL	A-7	0	95-100	95-100	90-100	80-100	35-60	15-30
	6-41	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	41-56	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	56	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
GuF*:											
Gilpin----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-20	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	20-29	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC, SM, SC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Upshur----------	0-6	Silty clay loam	CL, ML	A-6, A-7	0	95-100	95-100	90-100	80-95	35-50	11-25
	6-41	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	41-56	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	56	Weathered bedrock	---	---	---	---	---	---	---	---	---
GuF3*:											
Gilpin----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-20	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	20-29	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC, SM,SC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Upshur----------	0-6	Silty clay--------	MH, ML, CL	A-7	0	95-100	95-100	90-100	80-100	35-60	15-30
	6-41	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	41-56	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	56	Weathered bedrock	---	---	---	---	---	---	---	---	---
GvF*:											
Gilpin----------	0-3	Stony silt loam	GC, CL, SC, CL-ML	A-2, A-4, A-6	10-40	50-90	45-85	35-75	30-70	20-40	4-15
	3-20	Shaly silt loam, channery loam, silty clay loam.	GM-GC, CL, CL-ML, SC	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	20-29	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC, SM, SC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Upshur----------	0-6	Stony silty clay loam.	CL-ML, ML, CL	A-6, A-4	3-10	95-100	95-100	85-100	65-90	25-40	5-15
	6-41	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	41-56	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	56	Weathered bedrock	---	---	---	---	---	---	---	---	---
HaA, HaB--------- Hackers	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	90-100	90-100	75-100	60-90	20-35	3-12
	8-49	Silt loam, clay loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	90-100	90-100	90-100	75-95	25-40	4-18
	49-60	Stratified fine sandy loam to silty clay loam.	ML, CL, SM, SC	A-4, A-6	0	85-100	60-100	55-95	40-85	20-40	1-15

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Me-----------------Melvin	0-6	Silt loam--------	CL, CL-ML, ML	A-4	0	95-100	90-100	80-100	80-95	25-35	4-10
	6-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	80-95	25-40	5-20
MnB*, MnC*, MnC3*: Monongahela----	0-8	Silt loam--------	ML, SM, CL-ML, SM-SC	A-4	0-5	90-100	85-100	75-100	45-90	20-35	1-10
	8-24	Silt loam, clay loam, gravelly loam.	ML, CL, CL-ML	A-4, A-6	0-15	90-100	80-100	75-100	70-90	20-40	5-15
	24-48	Silt loam, sandy clay loam, gravelly loam.	ML, CL, SM, SC	A-4, A-6	0-10	80-100	60-100	55-95	45-95	20-40	3-15
	48-60	Gravelly loam, clay loam, sandy clay loam.	ML, CL, SM, SC	A-4, A-6	10-20	75-100	60-90	60-85	40-85	20-40	1-15
Tilsit---------	0-10	Silt loam--------	ML, CL, CL-ML	A-4	0	90-100	85-100	75-100	60-100	20-35	4-10
	10-22	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	65-100	25-40	5-20
	22-41	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	90-100	85-100	75-100	65-100	25-45	5-25
	41-46	Silt loam, silty clay loam, silty clay.	CL, CH, CL-ML	A-4, A-6, A-7	0-30	70-100	65-85	60-85	55-80	25-60	5-35
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mo-----------------Moshannon	0-9	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	70-95	22-40	3-15
	9-41	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	90-100	85-95	25-40	3-15
	41-60	Stratified silt loam to fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	80-100	70-100	65-95	50-85	25-40	3-15
Se-----------------Senecaville	0-10	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	60-90	20-35	3-12
	10-41	Silty clay loam, silt loam.	CL, ML, CL-ML	A-4, A-6	0	90-100	90-100	80-100	75-95	25-40	4-18
	41-60	Silt loam, fine sandy loam, loam.	ML, SM, SC, CL	A-4, A-6	0-5	90-100	70-100	65-95	45-90	20-40	1-15
Sn-----------------Sensabaugh	0-7	Silt loam--------	CL-ML, CL, ML	A-4	0-5	90-100	75-95	65-85	55-75	16-29	3-9
	7-22	Gravelly loam, gravelly clay loam, gravelly silty clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	2-18	70-95	55-90	45-75	35-65	20-35	5-14
	22-26	Gravelly loam, gravelly clay loam, gravelly silty clay loam.	SM-SC, SC, GM-GC, GC	A-4, A-6	5-25	70-90	55-75	45-65	35-55	22-36	6-15
	26-60	Gravelly loam, gravelly clay loam, gravelly fine sandy loam.	SM-SC, SC, GM-GC, GC	A-4, A-6, A-2	5-30	55-90	25-75	25-65	20-55	20-36	6-15
Ua*. Udorthents											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
UbB, UbC, UbD----Upshur	0-6	Silty clay loam	CL, ML	A-6, A-7	0	95-100	95-100	90-100	80-95	35-50	11-25
	6-41	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	41-56	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	56	Weathered bedrock	---	---	---	---	---	---	---	---	---
UcC3, UcD3-------Upshur	0-6	Silty clay-------	MH, ML, CL	A-7	0	95-100	95-100	90-100	80-100	35-60	15-30
	6-41	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	41-56	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	56	Weathered bedrock	---	---	---	---	---	---	---	---	---
UgB*, UgC*:											
Upshur----------	0-6	Silty clay loam	CL, ML	A-6, A-7	0	95-100	95-100	90-100	80-95	35-50	11-25
	6-41	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	41-56	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	56	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gilpin----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-20	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	20-29	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC, SM, SC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
UgC3*:											
Upshur----------	0-6	Silty clay-------	MH, ML, CL	A-7	0	95-100	95-100	90-100	80-100	35-60	15-30
	6-41	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	41-56	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	56	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gilpin----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-20	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	20-29	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC, SM, SC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
UgD*:											
Upshur----------	0-6	Silty clay loam	CL, ML	A-6, A-7	0	95-100	95-100	90-100	80-95	35-50	11-25
	6-41	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	41-56	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	56	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
UgD*:											
Gilpin----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-20	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	20-29	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC, SM, SC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
UgD3*:											
Upshur----------	0-6	Silty clay-------	MH, ML, CL	A-7	0	95-100	95-100	90-100	80-100	35-60	15-30
	6-41	Silty clay, clay	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	41-56	Silty clay loam, silty clay, clay.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	56	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gilpin----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-20	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	20-29	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC, SM, SC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
VaC, VaD--------- Vandalia	0-6	Silt loam--------	ML, CL	A-4, A-6, A-7	0-5	80-100	75-100	70-95	50-90	25-45	5-20
	6-50	Silty clay loam, channery silty clay, clay.	CL, CH, ML	A-6, A-7	0-5	75-100	70-95	65-90	60-85	35-55	15-30
	50-60	Silty clay, clay, channery silty clay loam.	CL, CH, ML, MH	A-6, A-7	0-5	70-100	65-100	60-100	55-100	30-55	10-30
VdC3, VdD3------- Vandalia	0-6	Silty clay loam	ML, CL	A-4, A-6, A-7	0-5	80-100	75-100	70-95	50-90	25-45	5-20
	6-50	Silty clay loam, channery silty clay, clay.	CL, CH, ML	A-6, A-7	0-5	75-100	70-95	65-90	60-85	35-55	15-30
	50-60	Silty clay, clay, channery silty clay loam.	CL, CH, ML, MH	A-6, A-7	0-5	70-100	65-100	60-100	55-100	30-55	10-30

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T
	In	In/hr	In/in	pH			
GaB, GaC: Gallia	0-15	0.6-2.0	0.18-0.23	4.5-5.5	Low	0.37	5
	15-67	0.6-2.0	0.12-0.18	4.5-5.5	Moderate	0.37	
	67-72	6.0-20	0.05-0.09	4.5-5.5	Low	0.10	
GlC, GlD, GlD3, GlE, GlF: Gilpin	0-3	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.32	3
	3-20	0.6-2.0	0.10-0.16	3.6-5.5	Low	0.24	
	20-29	0.6-2.0	0.06-0.10	3.6-5.5	Low	0.24	
	29	---	---	---	---	----	
GuE*: Gilpin	0-3	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.32	3
	3-20	0.6-2.0	0.10-0.16	3.6-5.5	Low	0.24	
	20-29	0.6-2.0	0.06-0.10	3.6-5.5	Low	0.24	
	29	---	---	---	---	----	
Upshur	0-6	0.2-0.6	0.12-0.16	4.5-6.5	Moderate	0.43	3
	6-41	0.06-0.2	0.10-0.14	4.5-8.4	High	0.28	
	41-56	0.06-0.2	0.08-0.12	5.1-8.4	Moderate	0.28	
	56	---	---	---	---	----	
GuE3*: Gilpin	0-3	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.32	3
	3-20	0.6-2.0	0.10-0.16	3.6-5.5	Low	0.24	
	20-29	0.6-2.0	0.06-0.10	3.6-5.5	Low	0.24	
	29	---	---	---	---	----	
Upshur	0-6	0.2-0.6	0.12-0.16	4.5-6.5	High	0.37	2
	6-41	0.06-0.2	0.10-0.14	4.5-8.4	High	0.28	
	41-56	0.06-0.2	0.08-0.12	5.1-8.4	Moderate	0.28	
	56	---	---	---	---	----	
GuF*: Gilpin	0-3	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.32	3
	3-20	0.6-2.0	0.10-0.16	3.6-5.5	Low	0.24	
	20-29	0.6-2.0	0.06-0.10	3.6-5.5	Low	0.24	
	29	---	---	---	---	----	
Upshur	0-6	0.2-0.6	0.12-0.16	4.5-6.5	Moderate	0.43	3
	6-41	0.06-0.2	0.10-0.14	4.5-8.4	High	0.28	
	41-56	0.06-0.2	0.08-0.12	5.1-8.4	Moderate	0.28	
	56	---	---	---	---	----	
GuF3*: Gilpin	0-3	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.32	3
	3-20	0.6-2.0	0.10-0.16	3.6-5.5	Low	0.24	
	20-29	0.6-2.0	0.06-0.10	3.6-5.5	Low	0.24	
	29	---	---	---	---	----	
Upshur	0-6	0.2-0.6	0.12-0.16	4.5-6.5	High	0.37	2
	6-41	0.06-0.2	0.10-0.14	4.5-8.4	High	0.28	
	41-56	0.06-0.2	0.08-0.12	5.1-8.4	Moderate	0.28	
	56	---	---	---	---	----	
GvF*: Gilpin	0-3	0.6-2.0	0.08-0.14	3.6-5.5	Low	0.17	3
	3-20	0.6-2.0	0.10-0.16	3.6-5.5	Low	0.24	
	20-29	0.6-2.0	0.06-0.10	3.6-5.5	Low	0.24	
	29	---	---	---	---	----	
Upshur	0-6	0.6-2.0	0.12-0.16	4.5-6.5	Moderate	0.37	3
	6-41	0.06-0.2	0.10-0.14	4.5-8.4	High	0.28	
	41-56	0.06-0.2	0.08-0.12	5.1-8.4	Moderate	0.28	
	56	---	---	---	---	----	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
HaA, HaB--------- Hackers	0-8	0.6-2.0	0.18-0.24	5.1-6.5	Low------------	0.32	4
	8-49	0.6-2.0	0.12-0.18	5.1-6.5	Moderate-------	0.32	
	49-60	0.6-2.0	0.12-0.18	5.1-6.5	Low------------	0.28	
Me--------------- Melvin	0-6	0.6-2.0	0.18-0.23	5.6-7.8	Low------------	0.43	5
	6-60	0.6-2.0	0.18-0.23	5.6-7.8	Low------------	0.43	
MnB*, MnC*, MnC3*:							
Monongahela----	0-8	0.6-2.0	0.18-0.24	4.5-5.5	Low------------	0.43	3
	8-24	0.6-2.0	0.14-0.18	4.5-5.5	Low------------	0.43	
	24-48	0.06-0.6	0.08-0.12	4.5-5.5	Low------------	0.43	
	48-60	0.2-0.6	0.08-0.12	4.5-5.5	Low------------	0.37	
Tilsit---------	0-10	0.6-2.0	0.16-0.22	3.6-5.5	Low------------	0.43	3
	10-22	0.6-2.0	0.16-0.22	3.6-5.5	Low------------	0.43	
	22-41	0.06-0.2	0.08-0.12	3.6-5.5	Low------------	0.43	
	41-46	0.06-0.6	0.08-0.12	3.6-5.5	Low------------	0.43	
	46	---	---	---	---------------	----	
Mo--------------- Moshannon	0-9	0.6-2.0	0.16-0.20	5.6-6.5	Low------------	0.37	5
	9-41	0.6-2.0	0.15-0.19	5.6-6.5	Low------------	0.37	
	41-60	0.6-2.0	0.14-0.18	5.6-6.5	Low------------	0.37	
Se--------------- Senecaville	0-10	0.6-2.0	0.18-0.24	5.1-6.5	Low------------	0.37	5
	10-41	0.2-2.0	0.12-0.18	5.1-6.5	Moderate-------	0.32	
	41-60	0.6-2.0	0.12-0.18	5.1-6.5	Low------------	0.28	
Sn--------------- Sensabaugh	0-7	0.6-6.0	0.12-0.18	5.6-7.8	Low------------	0.20	5
	7-22	0.6-6.0	0.10-0.16	5.6-7.8	Low------------	0.20	
	22-26	0.6-6.0	0.10-0.15	5.6-7.8	Low------------	0.20	
	26-60	0.6-6.0	0.08-0.14	5.6-7.8	Low------------	0.20	
Ua*. Udorthents							
UbB, UbC, UbD---- Upshur	0-6	0.2-0.6	0.12-0.16	4.5-6.5	Moderate-------	0.43	3
	6-41	0.06-0.2	0.10-0.14	4.5-8.4	High-----------	0.28	
	41-56	0.06-0.2	0.08-0.12	5.1-8.4	Moderate-------	0.28	
	56	---	---	---	---------------	----	
UcC3, UcD3------- Upshur	0-6	0.2-0.6	0.12-0.16	4.5-6.5	High-----------	0.37	2
	6-41	0.06-0.2	0.10-0.14	4.5-8.4	High-----------	0.28	
	41-56	0.06-0.2	0.08-0.12	5.1-8.4	Moderate-------	0.28	
	56	---	---	---	---------------	----	
UgB*, UgC*:							
Upshur-----------	0-6	0.2-0.6	0.12-0.16	4.5-6.5	Moderate-------	0.43	3
	6-41	0.06-0.2	0.10-0.14	4.5-8.4	High-----------	0.28	
	41-56	0.06-0.2	0.08-0.12	5.1-8.4	Moderate-------	0.28	
	56	---	---	---	---------------	----	
Gilpin----------	0-3	0.6-2.0	0.12-0.18	3.6-5.5	Low------------	0.32	3
	3-20	0.6-2.0	0.10-0.16	3.6-5.5	Low------------	0.24	
	20-29	0.6-2.0	0.06-0.10	3.6-5.5	Low------------	0.24	
	29	---	---	---	---------------	----	
UgC3*:							
Upshur-----------	0-6	0.2-0.6	0.12-0.16	4.5-6.5	High-----------	0.37	2
	6-41	0.06-0.2	0.10-0.14	4.5-8.4	High-----------	0.28	
	41-56	0.06-0.2	0.08-0.12	5.1-8.4	Moderate-------	0.28	
	56	---	---	---	---------------	----	
Gilpin----------	0-3	0.6-2.0	0.12-0.18	3.6-5.5	Low------------	0.32	3
	3-20	0.6-2.0	0.10-0.16	3.6-5.5	Low------------	0.24	
	20-29	0.6-2.0	0.06-0.10	3.6-5.5	Low------------	0.24	
	29	---	---	---	---------------	----	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T
	In	In/hr	In/in	pH			
UgD*:							
Upshur----------	0-6	0.2-0.6	0.12-0.16	4.5-6.5	Moderate-------	0.43	3
	6-41	0.06-0.2	0.10-0.14	4.5-8.4	High-----------	0.28	
	41-56	0.06-0.2	0.08-0.12	5.1-8.4	Moderate-------	0.28	
	56	---	---	---	---------------	----	
Gilpin----------	0-3	0.6-2.0	0.12-0.18	3.6-5.5	Low------------	0.32	3
	3-20	0.6-2.0	0.10-0.16	3.6-5.5	Low------------	0.24	
	20-29	0.6-2.0	0.06-0.10	3.6-5.5	Low------------	0.24	
	29	---	---	---	---------------	----	
UgD3*:							
Upshur----------	0-6	0.2-0.6	0.12-0.16	4.5-6.5	High-----------	0.37	2
	6-41	0.06-0.2	0.10-0.14	4.5-8.4	High-----------	0.28	
	41-56	0.06-0.2	0.08-0.12	5.1-8.4	Moderate-------	0.28	
	56	---	---	---	---------------	----	
Gilpin----------	0-3	0.6-2.0	0.12-0.18	3.6-5.5	Low------------	0.32	3
	3-20	0.6-2.0	0.10-0.16	3.6-5.5	Low------------	0.24	
	20-29	0.6-2.0	0.06-0.10	3.6-5.5	Low------------	0.24	
	29	---	---	---	---------------	----	
VaC, VaD, VdC3, VdD3------------ Vandalia	0-6	0.2-2.0	0.12-0.18	4.5-6.0	Moderate-------	0.37	4
	6-50	0.06-0.6	0.12-0.15	4.5-6.0	High-----------	0.28	
	50-60	0.06-0.6	0.08-0.12	5.1-7.3	High-----------	0.28	

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "occasional" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro- logic group	Flooding	High water table			Bedrock		Risk of corrosion	
		Frequency	Depth	Kind	Months	Depth	Hard- ness	Uncoated steel	Concrete
			Ft			In			
GaB, GaC---------- Gallia	B	None--------	>6.0	---	---	>60	---	Low------	High.
GlC, GlD, GlD3, GlE, GlF--------- Gilpin	C	None--------	>6.0	---	---	20-40	Soft	Low------	High.
GuE*, GuE3*, GuF*, GuF3*:									
Gilpin-----------	C	None--------	>6.0	---	---	20-40	Soft	Low------	High.
Upshur-----------	C	None--------	>6.0	---	---	>40	Soft	High-----	Moderate.
GvF*:									
Gilpin-----------	C	None--------	>6.0	---	---	20-40	Soft	Low------	High.
Upshur-----------	D	None--------	>6.0	---	---	>40	Soft	High-----	Moderate.
HaA, HaB---------- Hackers	B	Rare--------	>6.0	---	---	>60	---	Low------	Moderate.
Me---------------- Melvin	D	Occasional	0-1.0	Apparent	Dec-May	>60	---	High-----	Low.
MnB*, MnC*, MnC3*:									
Monongahela------	C	None--------	1.5-3.0	Perched	Dec-Apr	>60	---	High-----	High.
Tilsit-----------	C	None--------	1.5-2.5	Perched	Jan-Apr	>40	Hard	High-----	High.
Mo---------------- Moshannon	B	Occasional	4.0-6.0	Apparent	Feb-Mar	>60	---	Low------	Moderate.
Se---------------- Senecaville	B	Occasional	1.5-3.0	Apparent	Dec-Apr	>60	---	Moderate	Moderate.
Sn---------------- Sensabaugh	B	Occasional	4.0-6.0	Apparent	Jan-Apr	>60	---	Low------	Low.
Ua*. Udorthents									
UbB, UbC, UbD, UcC3, UcD3------- Upshur	C	None--------	>6.0	---	---	>40	Soft	High-----	Moderate.
UgB*, UgC*, UgC3*, UgD*, UgD3*:									
Upshur-----------	C	None--------	>6.0	---	---	>40	Soft	High-----	Moderate.
Gilpin-----------	C	None--------	>6.0	---	---	20-40	Soft	Low------	High.
VaC, VaD, VdC3, VdD3------------- Vandalia	C	None--------	4.0-6.0	Perched	Feb-Apr	>60	---	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Gallia	Fine-loamy, siliceous, mesic Typic Paleudalfs
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Hackers	Fine-silty, mixed, mesic Typic Hapludalfs
Melvin	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
*Monongahela	Fine-loamy, mixed, mesic Typic Fragiudults
Moshannon	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Senecaville	Fine-silty, mixed, mesic Fluvaquentic Eutrochrepts
Sensabaugh	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Tilsit	Fine-silty, mixed, mesic Typic Fragiudults
Udorthents	Udorthents
Upshur	Fine, mixed, mesic Typic Hapludalfs
Vandalia	Fine, mixed, mesic Typic Hapludalfs

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